3556 WEBSTER AVENUE
BLOCK 3360, LOT 62
BRONX, NEW YORK

Remedial Action Work Plan

E-Designation E-249

CEQR No. 10DCP035X

OER No. 12EH-N174X

Prepared for:

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LIST OF ACRONYMS

Acronym	Definition
AOC	Area of Concern
BOA	Brownfield Opportunity Area
CAMP	Community Air Monitoring Plan
CFR	Code of Federal Regulations
CHASP	Construction Health and Safety Plan
DCR	Declaration of Covenants and Restrictions
DDE	Dichlorodiphenyldichloroethylene
DDT	Dichlorodiphenyltrichloroethane
DUSR	Data Usability Summary Report
ECs	Engineering Controls
ESA	Environmental Site Assessment
ELAP	Environmental Laboratory Approval Program
GQS	Groundwater Quality Standards
HASP	Health and Safety Plan
HAZWOPER	Hazardous Waste Operations and Emergency Response
ICs	Institutional Controls
mcg/m^3	Micrograms per cubic meter
MTBE	Methyl tert-butyl ether
NOC	Notice of Completion
NYC VCP	New York City Voluntary Cleanup Program
NYC DEP	New York City Department of Environmental Protection
NYC DOB	New York City Department of Buildings
NYCRR	New York Codes Rules and Regulations
NYC OER	New York City Office of Environmental Remediation
NYSDEC	New York State Department of Environmental Conservation
NYSDEC DER	New York State Department of Environmental Conservation Division of Environmental Remediation

Acronym	Definition
OSHA	United States Occupational Health and Safety Administration
PAHs	Poly-Aromatic Hydrocarbons
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene
PE	Professional Engineer
PID	Photoionization Detector
PPE	Personal Protective Equipment
ppm	Parts per million
QA/QC	Quality Assurance/Quality Control
QEP	Qualified Environmental Professional
QHHEA	Qualitative Human Health Exposure Assessment
RA	Registered Architect
RAO	Remedial Action Objective
RAR	Remedial Action Report
RAWP	Remedial Action Work Plan or Plan
RCA	Recycled Concrete Aggregate
RCR	Remedial Closure Report
RI	Remedial Investigation
RIR	Remedial Investigation Report
SCO	Soil Cleanup Objective
SCG	Standards, Criteria and Guidance
SMP	Site Management Plan
SMMP	Soil/Material Management Plan
SPDES	State Pollutant Discharge Elimination System
SVOC	Semi-Volatile Organic Compound
TAL	Target Analyte List
TCE	Trichloroethene
ug/m3	Micrograms per Cubic Meter
VOC	Volatile Organic Compound

CERTIFICATION

I, Ira Pierce, am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 3556 Webster Avenue, Bronx, New York Site.

I, Doug Harm am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 3556 Webster Avenue, Bronx, New York Site.

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

_____
Name

_____
NYS PE License Number

_____
Signature

_____
Date

PE Stamp

_____
QEP Name

_____
QEP Signature

_____
Date

EXECUTIVE SUMMARY

Joy Construction Co. has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 0.42-acre site located at 3556 Webster Avenue, Bronx, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance, and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 3556 Webster Avenue, Bronx, New York, and is identified as Block 3360, Lot 62, on the New York City Tax Map. Refer to Figure 1 - Site Location Map and Figure 2 - Tax Map. The Site is approximately 18,125 square feet and is bounded by commercial and residential properties to the south, Woodlawn Cemetery to the west, undeveloped land to the north, and railroad tracks to the east. The property is presently vacant land.

Summary of Proposed Redevelopment Plan

The Applicant proposes to construct an eight (8)-story commercial and residential building with below grade parking. The cellar will consist of below grade parking, storage space and mechanical rooms. The ground floor will contain apartments only. The groundwater will also contain an open common area over the proposed parking garage. This area will consist of pavers, concrete and landscaping.

Summary of the Remedy

The proposed remedial action achieves protection of public health and the environment for the intended use of the property. The proposed remedial action achieves all of the remedial action objectives established for the project and addresses applicable standards, criterion, and guidance; it is effective in both the short-term and long-term and reduces mobility, toxicity, and volume of contaminants; it is cost effective and implementable; and, it uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan;
2. Performing a Community Air Monitoring Program for particulates and volatile organic carbon compounds during the excavation of material;
3. Establishing Track 1 Soil Cleanup Objectives (SCOs) for contaminants of concern;
4. Excavation and removal of soil/fill exceeding the SCOs;
5. Post excavation samples will determine if deep excavation for development achieves Track 1 SCOs for soil;
6. As part of standard construction practices, the use of a VaporBlock Plus 20-mil vapor/moisture barrier beneath the structure and along the foundation sidewalls will be installed;
7. Ventilation of the below grade parking area consistent with NYC Building Code. Ventilation will prevent accumulation of vapors within the building;
8. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations;
9. Site mobilization involving Site security setup, equipment mobilization, utility mark outs, and marking and staking of excavation areas;
10. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
11. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID);
12. Transportation and off-Site disposal of all soil/fill material excavated during the installation of the material to allow construction of the mechanical room floor and below grade parking garage in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan, and sampling and analysis of excavated media as required by disposal facilities;

13. Construction and maintenance of an engineered composite cover consisting of a 4 to 6-inch building slab to prevent human exposure to residual soil/fill remaining under the Site;

14. Submission of a Remedial Closure Report (RCR) that describes remedial activities, certifies that the remedial requirements have been achieved, describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP;

15. If Track 1 cleanup is not achieved, submission of an approved Site Management Plan (SMP) in the Remedial Action Report (RAR) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency;

16. If Track 1 cleanup is not achieved, recording of a Declaration of Covenants and Restrictions (DCR) that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without approval by the New York City Office of Environmental Remediation (NYC OER).

COMMUNITY PROTECTION STATEMENT

The OER created the NYC VCP to provide governmental oversight for the cleanup of contaminated property in New York City. This RAWP (cleanup plan) describes the findings of prior environmental studies that show the location of contamination at the site and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities. This cleanup plan also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

A Citizen Participation Plan and a Sustainability Statement are included in this cleanup plan and are presented in Appendices I and II.

Remedial Investigation and Cleanup Plan. Under the NYC VCP, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and to identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses. Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals, and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment. An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential

for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan. This cleanup plan includes a Health and Safety Plan that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration (OSHA). This plan includes many protective elements including those discussed below.

Site Safety Coordinator. This project has a designated Site Safety Coordinator to implement the Health and Safety Plan. The Safety Coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site Safety Coordinator is Duane Shinton and can be reached at 732-267-0657 (cell).

Worker Training. Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan. Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust, and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan (CAMP). Results will be regularly reported to the NYC OER. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a Contingency Plan).

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and include steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams, and by a series of other actions (called operational measures). The project is also required to comply with New York City noise control standards. Problems in these areas should be reported to the on-site Project Manager, Mr. Carmen Confrancesco, at 212-337-4512.

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be summarized in the final report, the RAR. This report will be submitted to the NYC OER and will be thoroughly reviewed.

Stormwater Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for stormwater management. The main elements of the stormwater management include physical barriers, such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation are 7 to 4 PM, Monday through Friday.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC VCP and provides project contact names and numbers and the locations of project documents that can be viewed.

Complaint Management. The contractor performing this cleanup is required to address all complaints. Any complaints can be reported to the facility Project Manager, Mr. Carmen Confrancesco, at 212-337-4512 or call 311 and mention that the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-Outs. To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal. All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations, and required permits will be obtained.

Soil Chemical Testing and Screening. All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held instruments, by sight, and by smell to ensure proper material handling and management and community protection.

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors, and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed, to protect stormwater catch basins and other discharge points.

Trucks and Covers. Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material. All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination. All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping. Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing. Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote

overall safety in trucking; and, (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in the RAR, the final report that will be available for review in the public document repositories located at Mosholu Library, 285 East 205th Street, Bronx, New York 10467 (718-882-8239).

Long-Term Site Management. Since the remedial plan is designed to achieve Track 1 SCOs, a Long Term Site Management Plan may not be required. Should Track I SCOs not be met, a Long Term Site Management Plan will be necessary. To provide long-term protection after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC OER. Requirements that the property owner must comply with are defined in the property's deed. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

Joy Construction Co. has applied to enroll in the NYC VCP to investigate and remediate a property located at 3556 Webster Avenue, Bronx, New York (the Site). An RI was performed to compile and evaluate data and information necessary to develop this RAWP in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides a remedial alternative analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance, and conforms with applicable laws and regulations.

1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 3556 Webster Avenue, Bronx, New York, and is identified as Block 3360, Lot 62, on the New York City Tax Map. Refer to Figure 1 - Site Location Map and Figure 2 - Tax Map. The Site is approximately 18,125 square feet and is presently vacant land.

1.2 PROPOSED REDEVELOPMENT PLAN

The Applicant proposes to construct an eight (8)-story commercial and residential building with below grade parking. The cellar will consist of below grade parking, storage space and mechanical rooms. The ground floor will contain apartments only. The ground floor will also contain an open common area over the proposed parking garage. This area will consist of pavers, concrete and landscaping. Signed architectural drawings are provided in Appendix III. The building associated with 3556 Webster Avenue is identified as Building E on the architectural drawings.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

Based on information contained in the Phase I Environmental Site Assessment (ESA), the subject site is surrounded by commercial and residential properties to the south, Woodlawn Cemetery to the west, undeveloped land to the north, and railroad tracks to the east.

1.4 REMEDIAL INVESTIGATION

An RI was performed and the results are documented in a report called *Remedial Investigation Report, 3556 Webster Avenue*, dated March 2012 (RIR).

Summary of Past Uses of Site and Areas of Concern (AOCs)

Based on information contained in the Phase I ESA, subject property consisted of undeveloped land in 1896 and 1900. The Sanborn Maps identify a residence on the subject property in 1914. The subject property was not identified in the resources searched in the City Directory for all years searched, with the exception of 1940 when "Central Iron Drill Sharpening Corp." was identified. Data suggest that no such company as Central Iron Drill Sharpening Corp. operated on the subject property and the listing was likely an error.

Based upon the findings of the Phase I ESA, the following AOCs were identified:

- Due to the urban location of the subject property, there is potential for the presence of urban historic fill.
- Based upon a review of the New York City Department of Environmental Protection's (NYCDEP's) most recent "E" Designation database on October 19, 2011, Lot 62 was assigned "E" Designation E-249, which includes Hazardous Materials Phase I and Phase II Testing Protocol.

Due to the recent requirement for site sampling protocol, a Phase II Site Investigation will be required to satisfy the City of New York's "E" Designation Program.

Summary of the Work Performed under the Remedial Investigation

The following work has been performed at the site:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e., structures, buildings, etc.);
2. Installed five (5) soil borings across the entire project Site and collected ten (10) soil samples from the soil borings for chemical analyses to evaluate soil quality;
3. Collected three (3) groundwater samples from the subject property to investigate the subsurface groundwater quality at the property; and,
4. Installed four (4) soil vapor sample probes and collected four (4) soil vapor samples for laboratory analysis

Summary of Environmental Findings

1. The elevation of the subject property changes significantly from west to east. The approximate elevation on the western edge of the property along Webster Avenue is 90 feet above sea level. A significant drop-off toward the east occurs where the approximate elevation above mean sea level is 75 feet at the railroad right of way bordering the eastern edge of the property.
2. Depth to groundwater varies from five (5) to 15 feet at the Site.
3. Groundwater flow is generally toward the southeast beneath the Site, based on topography.
4. The stratigraphy of the site, from the surface down, consists of brown sand and gravel to approximately four (4) feet below grade. A yellowish-brown medium to fine sand with trace gravel is present below four (4) feet.
5. Laboratory analysis of soil samples showed no exceedence of Track 1 Unrestricted Soil Cleanup Objectives (SCOs) for VOCs, except acetone and methylene chloride which marginally exceeded Track 1 SCOs in one sample and was also identified in lab blanks. Several VOCs were detected at low levels and well below Track 1 SCOs including MEK (6.9 ppb in one of ten samples). Toluene was identified at trace concentrations in 7 of ten samples but did not exceed 6.7 ppb in any sample. At least seven SVOCs were identified above Track 1 and Track 2 Restricted Residential SCOs. These compounds were all PAH and

were found at relatively low concentrations. Maximum total SVOC concentrations in soil was 124 ppm. Two pesticides exceeded Track 1 SCOs (4,4 DDT, 4,4 DDE) but did not exceed Track 2 Restricted Residential SCOs (all detections were less than 20 ppb). Seven metals exceeded Track 1 SCOs. Of these only two, arsenic (16.4 ppm) and mercury (1.26 ppm), exceeded Track 2 Restricted Residential SCOs in one sample each and both were detected less than 0.5 ppm above the Track 2 SCOs. No onsite source of contamination is evident in this soil sampling program.

6. Laboratory analysis of groundwater samples did not detect VOCs, SVOCs, Pesticides, or polychlorinated biphenyls (PCBs) at concentrations exceeding the Part 703.5 Class GA Groundwater Quality Standards (GQS). VOCs, pesticides and PCBs were not detected in any sample. Three SVOCs were detected at trace concentrations and well below GWS. Only three metals, aluminum, iron and manganese, were detected in groundwater samples at concentrations exceeding their respective NYSDEC GQS in dissolved samples. No onsite source of contamination is evident in this groundwater sampling program.

5. Soil vapor samples showed no detections of tetrachloroethene (PCE), trichloroethene (TCE), or chlorinated decay products, such as vinyl chloride. BTEX were detected in all samples at low concentrations. All BTEX and associated petroleum hydrocarbons were identified below 65 ug/m3 and in most instances did not exceed 10 ug/m3. Similar to soil and groundwater, no onsite source of contamination is evident from the soil vapor sampling program.

Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Groundwater

- Prevent direct exposure to contaminated groundwater.

Soil

- Prevent direct contact with contaminated soil.

Soil Vapor

- Prevent exposure to contaminants detected in soil vapor.
- Prevent migration of soil vapor into dwellings and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedence of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance; and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

Track 1 and Track 2 remedial action alternatives are considered in this alternatives analysis for the site. Alternative 1 is Track 1 alternative that involves attainment of Track 1 SCOs and complete removal of all soil and fill material that exceed the unrestricted Track 1 SCOs. Alternative 2 is Track 2 alternative that involves establishment of Track 2 Restricted Residential SCOs and removal of the soil and fill material that exceed the Track 2 SCOs. Following soil removal, the entire Site will be covered with a cover layer consisting of the building slab, sidewalks, and other impermeable cover. This cover layer will serve as an engineering control to reduce exposure to any residual contaminant in soils. Soil vapors would be managed by the operation of a ventilated parking area under the building and installation of a vapor barier.

3.1 THRESHOLD CRITERIA

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced, or controlled through removal, treatment, and implementation of Engineering Controls (ECs) or Institutional Controls (ICs). Protection of public health and the environment must be achieved for all approved remedial actions.

The Track 1 alternative would result in removal of all soil/fill with contaminant concentrations above Track 1 SCOs. As such, this alternative would be consistent with the RAOs and provide overall protection of public health and the environment in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and,
- Eliminating potential sources for on-site production of soil vapors.

Alternative 2 would achieve comparable protection of human health and the environment and would be consistent with the RAOs and would provide overall protection of public health and the environment in consideration of current and potential future land use by:

- Removing soil/fill with contaminant concentrations above Track 2 Restricted Residential SCOs;
- Placement of institutional and engineering controls, including a composite cover system.
- Eliminating the potential for direct contact with contaminated soil or groundwater by placement of a composite cover system and via institutional controls;
- Minimizing the potential for migration of soil vapor into occupied structures and associated inhalation exposures by operation of a ventilated parking garage beneath the building;
- Minimizing the potential for direct contact with contaminated on-site soils during the remediation by implementing an approved soil and materials management plan and CAMP.

3.2 BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCG)

The Track 1 alternative would comply with the SCG, as all soil/fill in excess of Track 1 SCOs would be removed. All potential sources for groundwater and soil vapor contamination would also be removed. All soil/fill excavated from the Site would be managed and disposed of in accordance with all applicable regulations.

The Track 2 alternative would address the chemical-specific SCGs for soil, groundwater, and soil vapor by attainment of Track 2 Restricted Residential SCOs. Similar to the Track 1 alternative, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs.

Short-Term Effectiveness and Impacts

This evaluation criterion assesses the effects of the alternatives during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

The Track 1 alternative would provide short-term effectiveness with the removal of all soil/fill above Track 1 SCOs. All potential exposure pathways for site-derived contaminants would be incomplete following construction. Implementation of this RAWP, which includes a CAMP and HASP would prevent unacceptable exposure during remediation and construction activities.

The Track 2 alternative would result in fewer short-term impacts associated with excavation, handling, load out of materials, and truck traffic than a Track 1 remediation. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

The Track 1 and Track 2 Alternatives are both considered to be effective in protecting human health and the environment in the short term. These alternatives would involve the removal of on-site contaminated soils and would eliminate (Track 1) or reduce (Track 2) exposure to contaminant sources. The implementation of appropriate measures, including a CAMP and a Soil/Materials Management Plan (SMMP), during all on-site soil disturbance activities will effectively prevent the release of significant contaminants into the environment. Construction workers operating under appropriate management procedures and a Health and Safety Plan (HASP) will be protected from on-site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones). Both alternatives provide short term effectiveness in protecting the surrounding community by decreasing the risk of contact with on-site contaminants. The implementation of a HASP

(incorporating a Community Health and Safety Plan) and a CAMP will serve to minimize potential short term impacts to the surrounding community from increased vehicle traffic, dust, vapors, and noise.

Long-Term Effectiveness and Permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site, and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of ECs.

As with the short-term effectiveness, the Track 1 alternative would provide the highest level of long-term effectiveness with the removal of all soil/fill above Track 1 SCOs.

The Track 2 alternative would also be effective over the long-term by attaining Track 2 Restricted-Residential SCOs through the placement of a concrete slab under the building, establishing use restrictions, establishing an SMP to ensure long-term management of Institutional and Engineering Controls, and placing a deed restriction to memorialize these controls for the long term. Groundwater use restrictions will eliminate potential exposure to groundwater, and establishment of an SMP and a deed restriction will ensure that this protection remains effective for the long-term (in perpetuity). The SMP will ensure long-term effectiveness of all Engineering and Institutional Controls by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and functioning as they were intended, assuring that protections designed into the remedy will provide continued high level of protection in perpetuity. Operation of a ventilated parking garage will minimize the potential for accumulation of vapors within the occupied structure and eliminate associated inhalation exposures.

Reduction of Toxicity, Mobility, or Volume of Contaminated Material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure, and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce the total volume of contaminated media.

Alternative 1 would permanently eliminate the toxicity, mobility, and volume of contaminants from on-site soil by removing all soil in excess of unrestricted use SCOs. Removal of soil to a depth of approximately 12 feet would occur. Alternative 2 would greatly reduce the toxicity, mobility, and volume of contaminants from on-site soil because it would include removal of as much as 10 feet of soil/fill for development purposes and will achieve Track 2 Restricted Residential SCOs. Placement of a building slab and ventilated parking below grade will lower toxicity by eliminating potential exposures with remaining soil, groundwater, and vapors. Groundwater use restrictions will reduce toxicity by ensuring that there is no use of on-Site groundwater for potable purposes.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g., obtaining permits for remedial activities), and availability of services and materials.

The Track 1 alternative is implementable. The remedial methods used are easily implemented using standard construction technologies.

Similarly, the Track 2 alternative is also both feasible and implementable. It uses standard materials and services and well established technology. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed, which utilize standard industry methods.

Cost Effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, disposal costs, and engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

The capital costs associated with the Track 1 alternative are higher than the Track 2 alternative in that a higher volume of soil/fill will be excavated for off-site disposal to achieve a Track 1 status over the entire site. Costs for Track 2 Alternative are higher for long term management in order to provide periodic inspection and reporting on the status of the remedy. In both cases, appropriate public health and environmental protections are achieved.

Both alternatives satisfy the threshold balancing criterion and other criterion listed here, and each is fully protective of public health and the environment, will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduces both mobility and toxicity.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial observations by the project team, both of the alternatives are believed to be acceptable to the community. This RAWP will be subject to, and undergo public review under, the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan.

Land Use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts; Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources; potential vulnerability of groundwater to contamination that might emanate from the site; proximity to flood plains, geography and geology; and current ICs applicable to the site.

Because of the complete soil removal, the Track 1 alternative provides protection of public health and the environment for both the proposed use of the Site and any future use. The Track 1 alternative provides a remedial action that is beneficial to the surrounding community and is consistent with the goals of the City for remediating and redeveloping brownfield sites.

The Track 2 alternative also provides protection for the intended use.

Both alternatives for remedial action at the site are comparable with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and residential properties and both alternatives provide comprehensive protection of public health and the environment for these uses. Improvements in the current brownfield condition of the property achieved by both alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse. Both alternatives are equally protective of natural resources and cultural resources. This RAWP will be subject to undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action, including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and, promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

Both remedial alternatives are comparable with respect to the opportunity to achieve sustainable remedial action.

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The proposed remedial action for this project is Alternative 1, the Track 1 remedial action. The SCOs proposed for this project are Track 1 Unrestricted SCOs. Based on the development plan, soil/fill at the site will be excavated to a maximum depth of 13 feet below present grade and it is anticipated that Track 1 SCOs will be achieved. End point samples will be used to determine if a Track 1 cleanup is achieved. Soil/fill remaining on site will be documented in the RCR and existing analytical data will be compared to SCOs to determine if soils achieve attainment of Track 1 SCOs.

The proposed plan achieves all of the remedial action goals established for the project. The proposed remedial action is effective in both the short term and long term and reduces mobility, toxicity, and volume of contaminants and uses standard methods that are well established in the industry.

The elements of this remedial action are:

1. Preparation of a Community Protection Statement and implementation of a Citizen Participation Plan;
2. Performing a Community Air Monitoring Program for particulates and volatile organic carbon compounds during the excavation of material;
3. Establishing Track 1 Soil Cleanup Objectives (SCOs) for contaminants of concern;
4. Excavation and removal of soil/fill exceeding the SCOs;
5. Post excavation samples will determine if deep excavation for development achieves Track 1 SCOs for soil;
6. As part of standard construction practices, the use of a VaporBlock Plus 20-mil vapor/moisture barrier beneath the structure and along the foundation sidewalls will be installed;
7. Ventilation of the below grade parking area consistent with NYC Building Code.

Ventilation will prevent accumulation of vapors within the building;

8. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations;

9. Site mobilization involving Site security setup, equipment mobilization, utility mark outs, and marking and staking of excavation areas;

10. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;

11. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a photoionization detector (PID);

12. Transportation and off-Site disposal of all soil/fill material excavated during the installation of the material to allow construction of the mechanical room floor and below grade parking garage in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan, and sampling and analysis of excavated media as required by disposal facilities;

13. Construction and maintenance of an engineered composite cover consisting of a 4 to 6-inch building slab to prevent human exposure to residual soil/fill remaining under the Site;

14. Submission of a Remedial Closure Report (RCR) that describes remedial activities, certifies that the remedial requirements have been achieved, describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP;

15. If Track 1 cleanup is not achieved, submission of an approved Site Management Plan (SMP) in the Remedial Action Report (RAR) for long-term management of residual contamination, including plans for operation, maintenance, monitoring, inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency;

16. If Track 1 cleanup is not achieved, recording of a Declaration of Covenants and

Restrictions (DCR) that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) vegetable gardening and farming; (2) use of groundwater without treatment rendering it safe for the intended use; (3) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (4) higher level of land usage without approval by the New York City Office of Environmental Remediation (NYC OER).

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix IV.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed of off-site is about 6,500 cubic yards and will be limited by the presence of bedrock outcropping at the Site. The disposal facility for site-derived impacted materials is listed below. Additional disposal locations established at a later date will be reported promptly to the OER Project Manager.

Disposal Facility	Waste Type	Estimated Quantities
Clean Earth of Carteret	Contaminated Non hazardous	6,500 cubic yards

End-Point Sampling

If hotspots are encountered, hotspot removal actions under this plan will be performed in conjunction with remedial end-point sampling. End-point sampling frequency will consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.

2. For excavations 20 to 300 feet in perimeter:

- For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

- For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

3. For sampling of volatile organics, bottom samples would be taken within 24 hours of excavation and would be taken from the zero (0) to six (6)-inch interval at the excavation floor. Samples taken after 24 hours would be taken at six (6) to twelve inches.

4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1 through 3 above.

Hotspot end-point sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for trigger analytes (those for which SCO exceedance is identified)

Quality Assurance/Quality Control

One duplicate and one matrix spike/matrix spike duplicate will be collected for every 20 samples.

Import and Reuse of Soils

Import of soils onto the property and reuse of soils already on site is not anticipated. If necessary, import of soil and/or reuse of soils already on site will be performed in conformance with the Soil/Materials Management Plan in Appendix IV.

4.3 ENGINEERING CONTROLS

EC's are not required on projects that achieve Track 1 cleanup. However, several environmental controls will be built into the building as part of construction. These include: composite cover system, vapor barrier, and sub-grade ventilated parking. If Track 1 cannot be achieved, these systems will be built as engineering controls to achieve a Track 2 cleanup. These systems are described below in the event a Track 2 cleanup must be implemented.

Composite Cover System

Exposure to residual soil/fill if Track 1 cannot be achieved will be prevented by a concrete building slab to be built on the Site. This composite cover system is comprised of a concrete building slab. This composite cover system is comprised of the 4 to 6-inch concrete building slab with vapor barrier. The development plan includes full build-out with the foundation slab for the building.

The site building slab would be a permanent engineering control for the Site if Track 1 is not achieved. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the SMP and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the SMP in the RAR.

Vapor Barrier

A VaporBlock Plus VBP 20-mil vapor barrier, manufactured by Raven Industries, will be installed beneath the structure's slab and along foundation sidewalls as part of building construction and will be an EC if Track 1 is not achieved. Installation details (penetrations, joints, etc.) with respect to the proposed building foundation, footings, slab, and sidewalls are provided in Appendix V. Product specification sheets are provided in Appendix V. The RCR will include photographs (maximum of two photos per page) of the installation process, Professional Engineer/Registered Architect (PE/RA) certified letter (on company letterhead) from the primary contractor responsible for installation oversight and field inspections, and a

copy of the manufacturer's certificate of warranty.

Sub-Grade Ventilated Parking

Sub-grade parking and a sub-grade ventilation system will be built in the cellar of the building as part of the development plan and will be installed in accordance with the NYC Department of Buildings (DOB) requirements. High volume air exchange that is required by the building code for indoor parking will serve to mitigate vapor intrusion and will be an engineering control if Track 1 cannot be achieved.

4.4 SITE MANAGEMENT PLAN

Site Management will not be required if this project achieves a Track 1 cleanup. If Track 1 cannot be achieved, Site Management will be employed. Site Management is the last phase of remediation and begins with the approval of the RAR and issuance of the Notice of Completion (NOC) for the remedial action. The SMP describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by this RAWP. The SMP is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. The property owner is responsible to ensure that all Site Management responsibilities defined in the SMP are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Voluntary Cleanup Agreement. This includes a plan for: (1) implementation of ECs and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of ECs; (4) inspection and certification of ECs; and, (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled on a periodic basis to be established in the SMP and will be subject to review and modification by OER. The SMP will be based on a calendar year, and certification reports will be due for submission to OER by March 31 of the year following the reporting period.

4.5 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT (QHHEA)

Investigations reported in the RIR are sufficient to complete a QHHEA. As part of the VCP process, a QHHEA was performed to determine whether the Site poses an existing or future health hazard to the Site's exposed or potentially exposed population. The sampling data from the RI were evaluated to determine whether there is any health risk by characterizing the exposure setting, identifying exposure pathways, and evaluating contaminant fate and transport. This EA was prepared in accordance with Appendix 3B and Section 3.3 (b) 8 of the NYSDEC Draft DER-10 Technical Guidance for Site Investigation and Remediation.

Known and Potential Sources

Based on the results of the RIR, the contaminants of concern are:

Soil:

- Arsenic and Mercury were detected exceeding both Track 1 Unrestricted Use SCOs and Track 2 Restricted-Residential Use SCOs.
- Pesticides, including 4,4'-DDE(p,p') and 4,4'-DDT(p,p'), were detected exceeding Track 1 SCOs but did not exceed Track 2 Restricted Residential SCOs;
- SVOCs, particularly Poly-Aromatic Hydrocarbons (PAHs), were detected exceeding Track 1 SCOs and Track 2 SCOs;
- VOCs, including Acetone and Methylene Chloride, were detected exceeding the NYSDEC Unrestricted Use/Track 1 SCO but did not exceed Track 2 Restricted Residential SCOs.

Groundwater:

- Three metals, Aluminum, Iron and Manganese, were detected in groundwater samples at concentrations exceeding their respective NYSDEC GQS and are considered part of regional groundwater impacts and not site related.

Soil Vapor:

- Low levels of VOCs, including Benzene, Ethylbezene, Xylenes and Toluene, were detected in the soil vapor point samples. PCE, TCE and associated chlorinated decay products were not detected in soil vapor.

Nature, Extent, Fate and Transport of Contaminants

Soil:

Metals and SVOCs are present throughout the site.

Groundwater:

No VOCs were identified in any groundwater samples. Metals of concern were not found in dissolved groundwater samples above GQS, indicating that the property is not contributing to groundwater standard violation. Regional groundwater impact for major metal salts is evident.

Soil Vapor:

Soil vapors are minimal and are not believed to be derived from the site.

Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and, (5) a receptor population. An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be documented. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill or soil;
- Inhalation of vapors and particulates; and,
- Dermal contact with water, fill, soil, or building materials.

Receptor Populations

On-Site Receptors

The Site is currently vacant and secured; therefore, there are no human receptors under current conditions. During construction and remediation activities, receptors will include construction and remediation workers. Under future conditions, receptors will include employees and customers of the proposed commercial establishments.

Off-Site Receptors

Potential off-site receptors within a 0.25-mile radius of the Site include adult and child residents, commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:

1. Commercial Businesses (up to 0.25 mile) – existing and future
2. Residential Buildings (up to 0.25 mile) – existing and future
3. Building Construction/Renovation (up to 0.25 mile) – existing and future
4. Pedestrians, Trespassers, Cyclists (up to .25 mile) – existing and future
5. Schools (up to .25 mile) – existing and future

Existence of Human Health Exposure

Current Conditions

The site is currently undeveloped with soil exposed at the land surface. In the areas where human exposure to contaminated soil is possible, potential migration pathway is likely complete for dermal absorption, ingestion, and inhalation. However, because the site is vacant and site access is secured, the potential exposure pathways are not complete except for site workers. Groundwater is not exposed at the site and, because the site is served by the public water supply, groundwater is not used at the site.

Construction/Remediation Activities

The potential exposure pathways to on-site contamination are by ingestion, dermal, or inhalation exposure by on-site workers during the remedial action. During the remedial action, on-site exposure pathways will be eliminated by preventing access to the site and through implementation of soil/materials management, stormwater pollution prevention, dust controls, employment of a community air monitoring plan, and implementation of a Construction Health and Safety Plan (CHASP).

Proposed Future Conditions

Under future remediated conditions, the site will be fully capped, limiting potential direct exposure to soil and groundwater remaining in place, and the vapor barrier and ventilated parking garage will prevent potential for inhalation via soil vapor intrusion. There are no plausible off-site pathways for oral, inhalation, or dermal exposure to contaminants derived from the site.

Overall Human Health Exposure Assessment

Complete on-site exposure pathways appear to be present only during the construction and remediation phase. During the remedial action, on-site exposure pathways will be minimized by: preventing access to the site; through implementation of soil/materials management, stormwater pollution prevention, and dust controls; employment of a community air monitoring plan; and, implementation of a CHASP.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 PROJECT ORGANIZATION AND OVERSIGHT

Principal personnel who will participate in the remedial action include Professional Engineer Ira N. Pierce, PE, and Qualified Environmental Professional (QEP) Doug Harm, Registered Professional Geologist.

5.2 SITE SECURITY

Site access will be controlled by a guarded gated entrance and an entirely fenced property.

5.3 WORK HOURS

The hours for operation of remedial construction will be from 7:00 AM to 4:00 PM. These hours conform to the NYC DOB construction code requirements.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The site-specific CHASP is provided in Appendix VI. Prior to the commencement of the project, a Site Safety Coordinator will be assigned and report to OER. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and Hazardous Waste Operations and Emergency Response (HAZWOPER) requirements.

Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the CHASP and applicable laws and regulations. The CHASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Satisfaction.

All field personnel involved in remedial activities will participate in training required under 29 CFR (Code of Federal Regulations) 1910.120, including 40-hour Hazardous Waste Operator training and annual eight (8)-hour refresher training. The Site Safety Officer will be responsible for maintaining workers' training records.

Personnel entering any exclusion zone will be trained in the provisions of the CHASP and will be required to sign a CHASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending upon the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental), emergency procedures, personal protective equipment (PPE) levels, and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the CHASP. That document will define the specific project contacts for use in case of emergency.

5.5 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring for VOCs and particulate levels at the work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during nonintrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street in the midst of a public park or adjacent to a school or residence. Exceedances of action levels observed during performance of the CAMP will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds five (5) parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below five (5) ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of five (5) ppm over background, but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet) is below five (5) ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shut down.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a reevaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for OER personnel to review.

5.6 AGENCY APPROVALS

All permits or government approvals required for remediation and construction have been or will be obtained prior to the commencement of remediation and construction. Acceptance of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 SITE PREPARATION

Preconstruction Meeting

OER will be invited to attend the preconstruction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations, and utility

markouts. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations and a copy of the Markout Ticket will be retained by the Contractor prior to the start of drilling, excavation, or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive excavation or other remedial activities performed under the RAWP.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations. The location of proposed equipment and material staging areas, truck inspection station, stockpile areas, and other pertinent remedial management features will be in the center of the property, with access from Webster Avenue.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill, or debris off Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill, and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

5.8 TRAFFIC CONTROL

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site is to head south on Webster Avenue. Turn right onto and merge onto I-95 and travel I-95 to the New Jersey Turnpike.

5.9 DEMOBILIZATION

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination; and,
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 REPORTING AND RECORD KEEPING

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint, actions taken, etc.);
- A summary of CAMP excursions, if any; and,
- Photographs of notable Site conditions and activities.

Daily report template will be provided by OER. The frequency of the reporting period may be revised in consultation with the OER Project Manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP, or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER Project Manager by personal communication. Daily reports will be included as an Appendix in the RAR.

Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on Site during the project and will be available for inspection by OER staff.

Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas. Photographs will be submitted at the completion of the project in the RAR in digital format (i.e., jpeg files).

5.11 COMPLAINT MANAGEMENT

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the RAR. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER, noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and,
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

5.13 DATA USABILITY SUMMARY REPORT

The primary objective of a Data Usability Summary Report (DUSR) is to determine whether or not data meets the site-specific criteria for data quality and data use. The DUSR provides an evaluation of analytical data without third party data validation. The DUSR for post-remedial samples collected during implementation of this RAWP will be included in the RAR.

6.0 REMEDIAL ACTION REPORT

An RAR will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests, and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan;
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, Quality Assurance/Quality Control (QA/QC) results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site, including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material;
- Account of the origin and required chemical quality testing for material imported onto the Site;
- Recorded DCR; and,
- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

I, Ira Pierce, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 3556 Webster Avenue Site.

I, Doug Harm, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 3556 Webster Avenue Site.

I certify that the OER-approved Remedial Action Work Plan dated March 2012 and in any Stipulations were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a six (6)-month remediation period is anticipated.

Schedule Milestone	Weeks from Remedial Action Start	Duration (weeks)
OER Approval of RAWP	0	-
Fact Sheet 2 announcing start of remedy	1	-
Mobilization	2	3
Remedial Excavation	3	10
Demobilization	14	14
Submit Remedial Action Report	22	8

APPENDIX I

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and Joy Construction Co. have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, Joy Construction Co. will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site.

Project Contact List. OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager.

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. Joy Construction Co. will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Melrose Branch Library

910 Morris Avenue, Bronx

718-588-0110

10:00AM to 5:00PM, closed Sunday

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by Joy Construction Co. reviewed and approved by OER prior to distribution and mailed by Joy Construction Co. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.

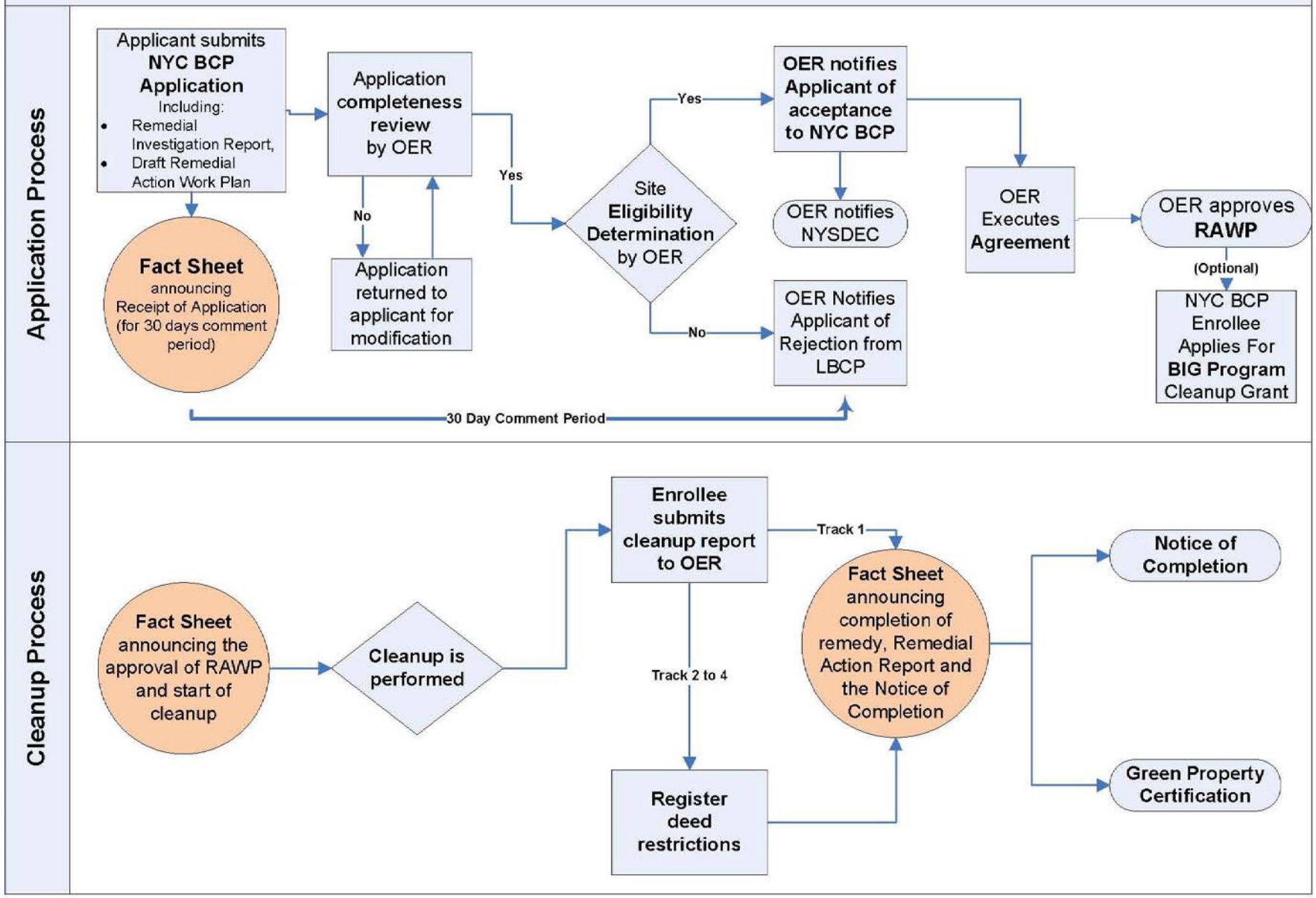
- **Public Notice announcing the approval of the RAWP and the start of remediation**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.

- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**

Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site, and announcing the issuance of the Notice of Completion.

Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)



APPENDIX II
SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials. Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the Remedial Action Report (RAR).

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency. Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the RAR. Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

Recontamination Control. Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

Under future conditions, building recontamination from potential off-site sources will be prevented through the use of a vapor barrier below the buildings slabs and the construction of sub-grade depressurization systems. Current regulations will be met for storage and handling of any materials on site that may present a potential recontamination threat. If a Track 1 remedy cannot be achieved, long term site management will include periodic site inspection that will identify and correct any new issues of environmental concern.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Linkage with Green Building. Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Voluntary Cleanup Program. Joy Construction Co. is participating in OER's Paperless Voluntary Cleanup Program. Under this program, submission of electronic documents will replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. Joy Construction Co. is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing, to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings. Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of the number of trees planted or preserved will be reported in the RAR.

APPENDIX III

ARCHITECTURAL DRAWINGS

APPENDIX IV

SOIL/MATERIALS MANAGEMENT PLAN

1.1 SOIL SCREENING METHODS

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 STOCKPILE METHODS

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 CHARACTERIZATION OF EXCAVATED MATERIALS

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and

regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 MATERIALS EXCAVATION, LOAD-OUT AND DEPARTURE

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 OFF-SITE MATERIALS TRANSPORT

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with

applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are in the Section 5.8 of the RAWP. This routing takes into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 MATERIALS DISPOSAL OFF-SITE

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

1.7 MATERIALS REUSE ON-SITE

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in the RAWP. “Reuse on-Site” means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to Engineering Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 DEMARCATION

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the

SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 IMPORT OF BACKFILL SOIL FROM OFF-SITE SOURCES

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in

compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

1.10 SOURCE SCREENING AND TESTING

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.11 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.12 STORM-WATER POLLUTION PREVENTION

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.13 CONTINGENCY PLAN

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.14 ODOR, DUST AND NUISANCE CONTROL

Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.
- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

1.15 IMPORT OF CLEAN COVER

No soil is anticipated to be imported to the Site for use as clean cover. In the event that the development plan changes and clean cover is necessary to cap any open space/ residual fill, the following protocol will be used.

All imported soil will be uncontaminated, clean soil that meets the lesser of the appropriate NYSDEC 6 NYCRR Part 375-6.8 Restricted Use Class SCOs and the NYSDEC 6 NYCRR Part 375-6.8 groundwater protection SCO.

The imported uncontaminated, clean soil cover will be from an approved source/facility and will be evaluated by the PE/QEP to ensure:

1) That a segregated stockpile is properly maintained at the source and will not be comingled with any other material prior to importing and grading the clean soil material at the Site;
2) That the material does not include any solid waste, including construction and demolition material, as it's prohibited;
3) That screening for evidence of contamination by visual, olfactory and PID soil screening practices prior to testing at the source as well as upon importing to the Site for grading is completed; and
4) That a maximum five-part composite sample will be collected from the segregated stockpile at the source at a minimum frequency of one sample per 250 cubic yards and analyzed for the following Full List parameters:
    - VOCs by EPA Method 8260C (rev. 2006)
    - SVOCs by EPA Method 8270D (rev. 2007)
    - Pesticides by EPA Method 8081B (rev. 2000)
    - PCBs by EPA Method 8082A (rev. 2000)
    - TAL Metals by EPA Method 6010C (rev. 2007)

APPENDIX V

VAPOR/MOISTURE BARRIER

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier

RAVEN INDUSTRIES

Product Description

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

Product Use

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

Size & Packaging

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.

Under-Slab Vapor/Gas Retarder

Product	Part #
VaporBlock Plus 20	VBP 20

APPLICATIONS

- Radon Barrier
- Methane Barrier
- VOC Barrier
- Under-Slab Vapor Retarder
- Foundation Wall Vapor Retarder

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VAPORBLOCK® PLUS™ VBP20

ISO 9001:2008 CERTIFIED MANAGEMENT SYSTEM

Under-Slab Vapor / Gas Barrier

PROPERTIES	TEST METHOD	VAPORBLOCK PLUS 20 IMPERIAL	VAPORBLOCK PLUS 20 METRIC
Appearance		White/Gold	
Thickness, Nominal		20 mil	0.51 mm
Weight		102 lbs/MSF	498 g/m²
Classification	ASTM E 1745	CLASS A, B & C	
Tensile Strength lbf/in (N/cm) average MD & TD (new material)	ASTM E 154 Section 9 (D-882)	58 lbf	102 N
Impact Resistance	ASTM D 1709	2600 g	
Maximum Use Temperature		180° F	82° C
Minimum Use Temperature		-70° F	-57° C
Permeance (new material)	ASTM E 154 Section 7 ASTM E 96 Procedure B	0.0051 Perms grains/(ft²·hr·in·Hg)	0.0034 Perms g/(24hr·m²·mm Hg)
Radon Diffusion Coeffiecient	K124/02/95	$< 1.1 \times 10^{-13}$ m²/s	
Methane Permeance	ASTM D 1434	$< 1.7 \times 10^{-10}$ m²/d• atm 0.32 GTR (Gas Transmission Rate) ml/m²•D•ATM	

VaporBlock® Plus™ Placement

All instructions on architectural or structural drawings should be reviewed and followed.
Detailed installation instructions accompany each roll of VaporBlock® Plus™ and can also be located on our website.
ASTM E-1643 also provides general installation information for vapor retarders.

VaporBlock® Plus™
UNDERSLAB VAPOR RETARDER / GAS BARRIER

VaporBlock® Plus™ is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage.

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www.ravenefd.com

Limited Warranty available at www.RavenEFD.com

VaporBlock® Plus™

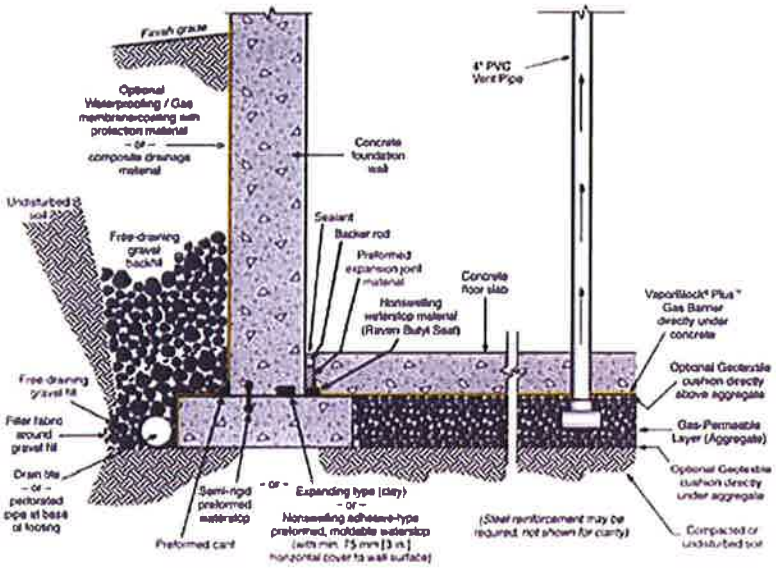
UNDERSLAB VAPOR RETARDER / GAS BARRIER

INSTALLATION GUIDELINES

Please Note: *Read these instructions thoroughly before installation to ensure proper use of* ***VaporBlock® Plus™****. ASTM E 1465, ASTM E 2121 and, ASTM E 1643 also provide valuable information regarding the installation of vapor / gas barriers. When installing this product, contractors shall conform to all applicable local, state and federal regulations and laws pertaining to residential and commercial building construction.*

- **When VaporBlock Plus gas barrier is used as part of an active control system for radon or other gas, a ventilation system will be required.**
- **If designed as a passive system, it is recommended to install a ventilation system that could be converted to an active system if needed.**

Materials List:
VaporBlock® Plus™ Vapor / Gas Barrier
VaporBond Plus 4" Foil Seaming Tape
Butyl Seal 2-Sided Tape
VaporBoot Plus Pipe Boots 12/Box (recommended)
VaporBoot Tape (optional)



Elements of a moisture/gas-resistant floor system. General illustration only.
(Note: This example shows multiple options for waterstop placement.

VAPORBLOCK® PLUS™ PLACEMENT

1.1. Level and tamp or roll granular base as specified. A base for a gas-reduction system may require a 4" to 6" gas permeable layer of clean coarse aggregate as specified by your architectural or structural drawings after installation of the recommended gas collection system. In this situation, a cushion layer consisting of a non-woven geotextile fabric placed directly under **VaporBlock® Plus™** will help protect the barrier from damage due to possible sharp coarse aggregate.

1.2. Unroll **VaporBlock Plus** running the longest dimension parallel with the direction of the pour and pull open all folds to full width. (Fig. 1)

1.3. Lap **VaporBlock Plus** over the footings and seal with Raven Butyl Seal tape at the footing-wall connection. Prime concrete surfaces and assure they are dry and clean prior to applying Raven Butyl Seal Tape. Apply even and firm pressure with a rubber roller. Overlap joints a minimum of 6" and seal overlap with Raven VaporBond Tape. When used as a gas

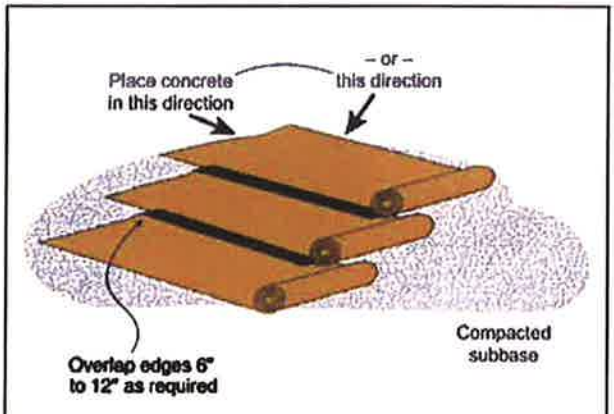


Fig. 1: VaporBlock Plus Overlaping Roll-out Method

Fig. 2: VaporBlock Plus Overlap Joint Sealing Methods

barrier, overlap joints a minimum of 12" and seal in-between overlap with 2-sided Raven Butyl Seal Tape. Then seal with VaporBond Plus Tape centered on the overlap seam. (Fig. 2)

1.4. Seal around all plumbing, conduit, support columns or other penetrations that come through the **VaporBlock Plus** membrane. Pipes four inches or smaller can be sealed with Raven VaporBoot Plus preformed pipe boots. VaporBoot Plus preformed pipe boots are formed in steps for 1", 2", 3" and 4" PVC pipe or IPS size and are sold in units of 12 per box (Fig. 3 & 5).

Pipe boots may also be fabricated from excess **VaporBlock Plus** membrane (Fig. 4 & 6) and sealed with VaporBoot Tape or VaporBond Plus Tape (sold separately).

Reminder Note: All holes or penetrations through the membrane will need a patch cut to a minimum of 12" from the opening in all directions.

To fabricate pipe boots from **VaporBlock Plus** excess material (see Fig. 4 & 6 for A-F):

A) Cut a square large enough to overlap 12" in all directions.

B) Mark where to cut opening on the center of the square and cut four to eight slices about 3/8" less than the diameter of the pipe.

C) Force the square over the pipe leaving the tightly stretched cut area around the bottom of the pipe with approximately a 1/2" of the boot material running vertically up the pipe. *(no more than a 1/2" of stretched boot material is recommended)*

D) Once boot is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in between the two layers. Secure boot down firmly over the membrane taking care not to have any large folds or creases.

E) Use VaporBoot Tape or VaporBond Plus Tape to secure the boot to the pipe.

VaporBoot Tape (option) – fold tape in half lengthwise, remove half of the release liner and wrap around the pipe allowing 1" extra for overlap sealing. Peel off the second half of the release liner and work the tape outward gradually forming a complete seal.

VaporBond Plus Tape (option) - Tape completely around pipe overlapping the to get a tight seal against the pipe.

F) Complete the process by taping over the boot perimeter edge with VaporBond Plus Tape to create a monolithic membrane between the surface of the slab and gas/ moisture sources below and at the slab perimeter. (Fig. 4 & 6)

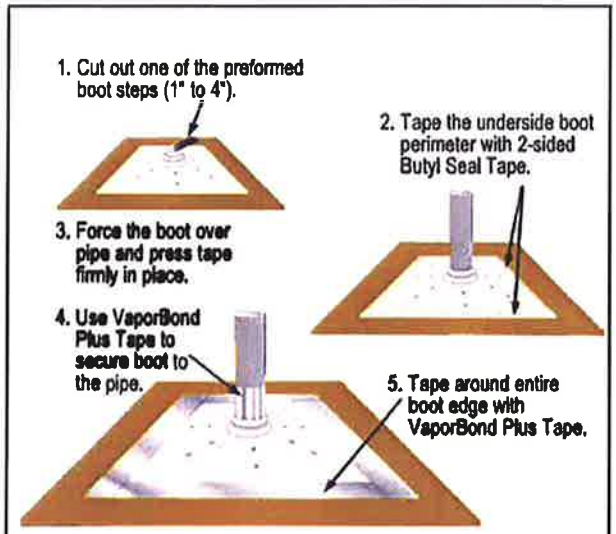


Fig. 3

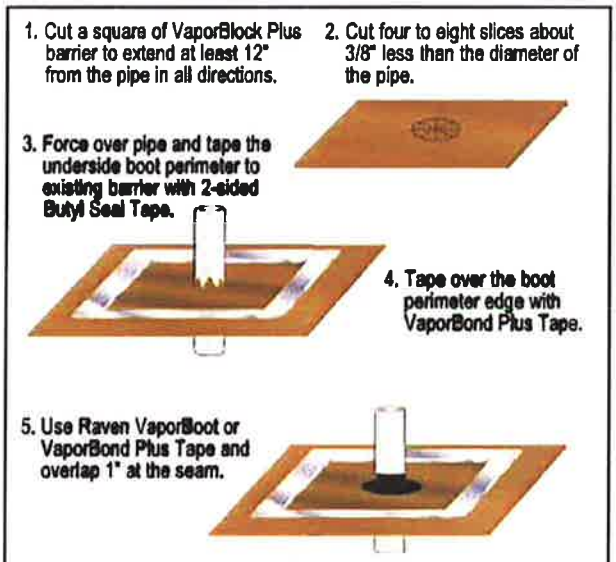


Fig. 4

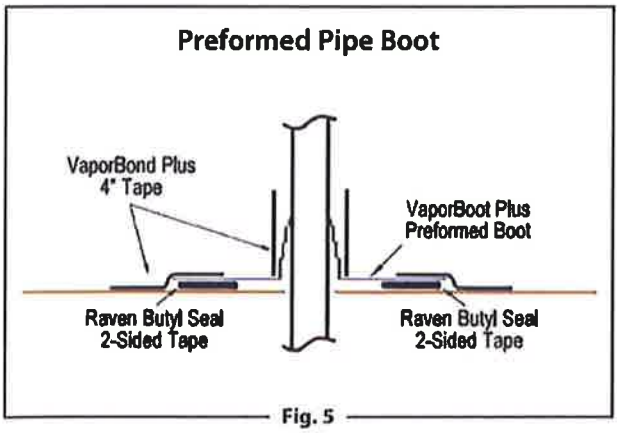


Fig. 5

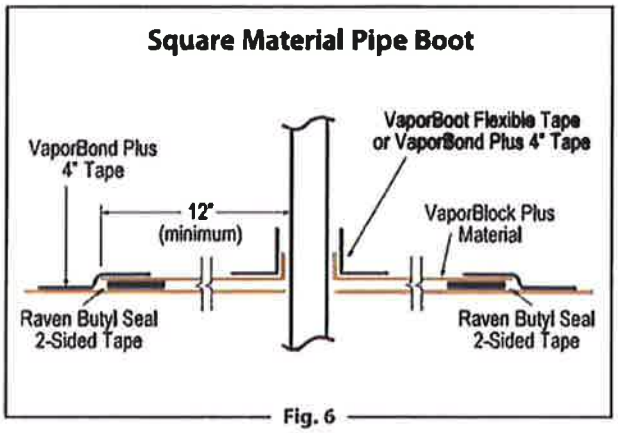


Fig. 6

MULTIPLE PENETRATION PIPE BOOT INSTALLATION

1.5. For side-by-side multiple penetrations;

A) Cut a patch large enough to overlap 12" in all directions (Fig. 7) of penetrations.

B) Mark where to cut openings and cut four to eight slices about 3/8" less than the diameter of the penetration for each.

C) Slide patch material over penetration to achieve a tight fit.

D) Once patch is positioned, seal the perimeter to the membrane by applying 2-sided Raven Butyl Seal Tape in-between the two layers. (Fig. 8)

E) After applying Raven Butyl Seal Tape between the patch and membrane, tape around each of the penetrations and the patch with VaporBond Plus 4" foil tape. (Fig. 9) For additional protection apply an acceptable polyurethane elastomeric sealant around the penetrations. (Fig. 10)

1.6. Holes or openings through **VaporBlock Plus** are to be repaired by cutting a piece of **VaporBlock Plus** 12" larger in all directions from the opening. Seal the patch to the barrier with 2-sided Raven Butyl Seal Tape and seal the edges of the patch with VaporBond Plus Tape.

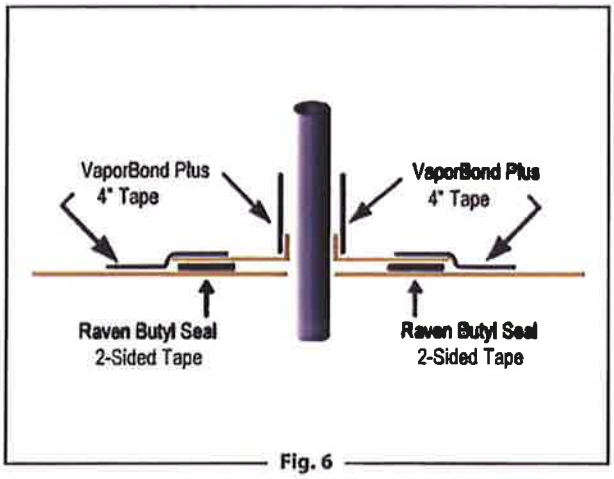


Fig. 6

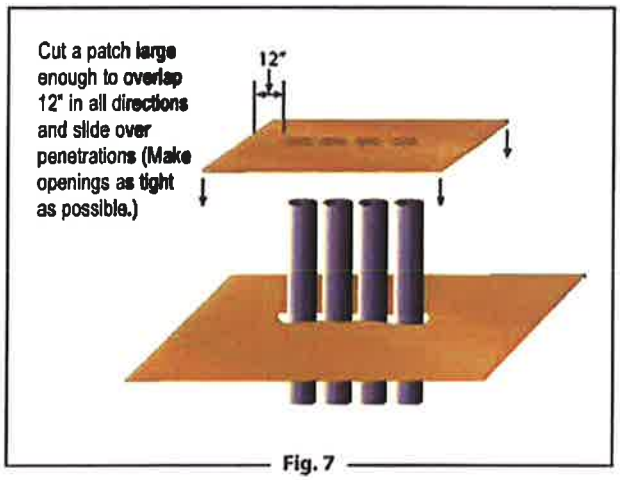


Fig. 7

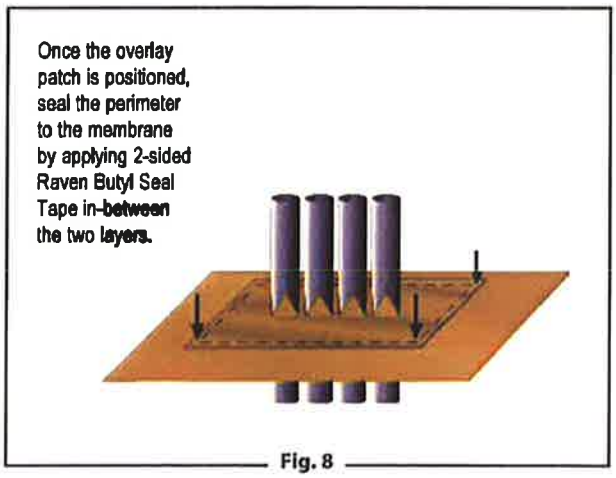


Fig. 8

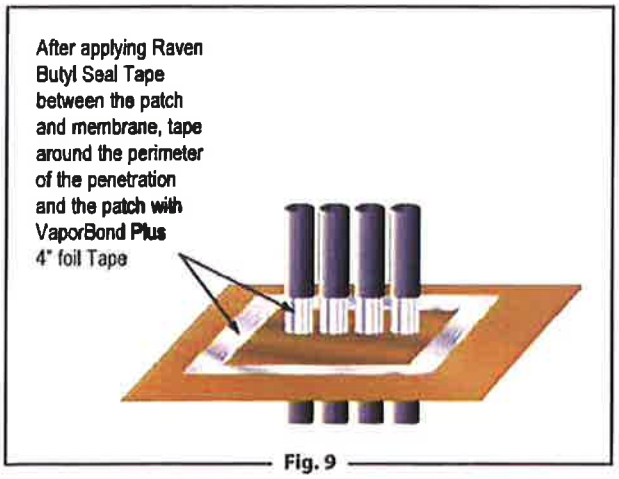


Fig. 9

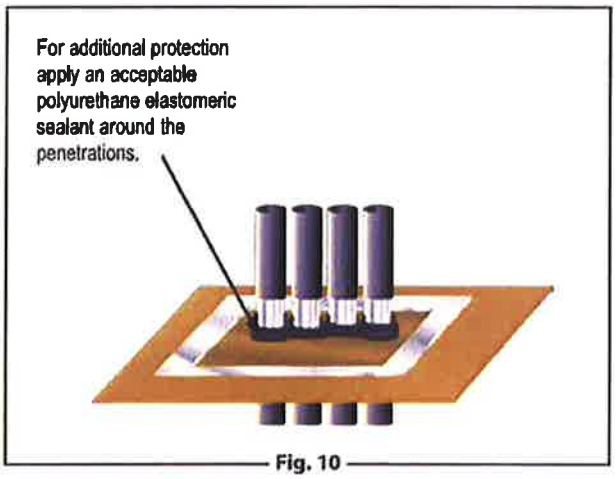


Fig. 10

VAPORBLOCK® PLUS™ PROTECTION

2.1. When installing reinforcing steel and utilities, in addition to the placement of concrete, take precaution to protect **VaporBlock Plus.** Carelessness during installation can damage the most puncture-resistant membrane. Sheets of plywood cushioned with geotextile fabric temporarily placed on **VaporBlock Plus** provide for additional protection in high traffic areas including concrete buggies.

2.2. Use only brick-type or chair-type reinforcing bar supports to protect **VaporBlock Plus** from puncture.

2.3. Avoid driving stakes through **VaporBlock Plus.** If this cannot be avoided, each individual hole must be repaired per section 1.6.

2.4. If a cushion or blotter layer is required in the design between **VaporBlock Plus** and the slab, additional care should be given if sharp crushed rock is used. Washed rock will provide less chance of damage during placement. Care must be taken to protect blotter layer from precipitation before concrete is placed.

Note: To the best of our knowledge, these are typical installation procedures and are intended as guidelines only. Architectural or structural drawings must be reviewed and followed as well on a project basis. NO WARRANTIES ARE MADE AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS OR GUIDELINES REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and we disclaim all liability for resulting loss or damage.

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ISO 9001:2000
CERTIFIED MANAGEMENT SYSTEM

www.vaporblockplus.com

6/09 EFD 1127

VI

APPENDIX VI

CONSTRUCTION HEALTH AND SAFETY PLAN

SITE-SPECIFIC CONSTRUCTION HEALTH AND SAFETY PLAN

3556 Webster Avenue
Block 3360, Lot 62
Bronx, New York

1.0 INTRODUCTION

This Site-Specific Construction Health and Safety Plan (CHASP) was prepared in accordance with the requirements and guidelines of the applicable Occupational Safety and Health Administration (OSHA) requirements in 29 Code of Federal Regulations (CFR) Part 1910.120. This CHASP has been prepared for the property at 3556 Webster Avenue, Bronx, New York. The CHASP will be available for inspection and review by site workers and regulatory personnel during work activities involving the installation of monitoring wells, soil vapor sampling and structural support work related to retaining wall repair. Site workers are required to comply with this CHASP when conducting the site activities listed in Section 2.0. Site workers will notify the Site Safety Officer of matters regarding health, safety and security.

All personnel and subcontractors must familiarize themselves with material contained herein, including special conditions and facilities located near each project as listed on the following pages. The information contained in this CHASP pertains to the installation of soil borings and the collection of soil and groundwater samples for laboratory analysis.

2.0 ENTRY OBJECTIVES

The objective of entry to the Work Area is to install monitoring wells, install piles, collect soil vapor samples and excavate as necessary to install foundations for retaining wall support. Soil has been documented to be impacted by contaminants associated with urban historic fill. No All soil will remain on-site during the work outlined in this CHASP. Work performed at the site will be done in accordance with 29 CFR 1926, Subpart P, and all other appropriate federal and state regulations.

3.0 ON-SITE ORGANIZATION AND COORDINATION

Key project personnel and their responsibilities to carry out the stated job function at the site are discussed below.

Brinkerhoff Environmental Services, Inc. (Brinkerhoff) will provide health and safety support, associated with environmental issues. The contact information for the designated person to provide Health and Safety support for this project is:

Duane Shinton, Health and Safety Officer
Brinkerhoff Environmental Services, Inc.
1805 Atlantic Avenue
Manasquan, New Jersey 08736
Phone: (732) 223-2225, Fax: (732) 223-3666

The Construction Health and Safety Officer for overall administration of this CHASP during installation of piles and footings is designated below. The Construction Health and Safety Officer's responsibilities will include overall project safety and health monitoring for the work to be performed. The Construction Health and Safety Officer will enforce and audit the effectiveness of the CHASP on a continuing basis and make changes to ensure that the intent of the CHASP is maintained.

Carmen Confrancesco
Joy Construction Co.
40 Fulton Street
New York, NY 10038
Cell: 917-337-4512 Office: 212-337-4512

4.0 ON-SITE CONTROL

Excavating Precautions (Utilities)

1. A utility markout of all underground utilities will be completed prior to the inception of ground-intrusive work, in compliance with 29 CFR 1926.651. The utility markout will utilize the One Call system prior to the commencement of operations at the site. Work will commence less than 10 business days after contacting the One Call system.
2. Visually inspect all utility markout locations on site.
3. Operations in the vicinity of overhead power lines will be conducted in accordance with 29 CFR 1910.333 (c)(3).
4. Conduct all excavations and subsequent soil sampling in the vicinity of a utility with caution.
5. If a utility line is damaged, call the utility company immediately.

Dust Prevention and Control (Track out onto Paved Public Roadways)

1. Vehicles leaving the site should be cleaned/decontaminated prior to exiting.
2. Promptly remove mud, dirt, or similar debris from the paved road.
3. Water flush and/or vacuum sweep the paved road.
4. Prepare unpaved site ingress and egress points by applying gravel to the surface to control track out and erosion.
5. The surface of the ingress and egress points must be kept adequately wet with water.

Dust Prevention and Control (General Procedures for Unpaved Areas)

1. Apply gravel to entrance, exit, and other areas of the site that are likely to see heavy vehicular traffic.
2. Limit vehicle traffic to required vehicles.
3. Limit vehicle speeds on unpaved areas of the site. Placement of signs near the site entrance that denote site speed restrictions is advised.
4. Apply sufficient water to unpaved surfaces that are likely to be disturbed to keep them adequately wet. According to 40 CFR Part 61, adequately wet means sufficiently mixed or penetrated with liquid to prevent the release of particulates. Visibly detectable dust emissions are the primary indication that the unpaved work area has not been kept adequately wet.

Dust Prevention and Control (Procedures for Grading and Excavation)

1. When soil is to be moved or stockpiled, the drop height of the soil should be reduced as much as possible.
2. Limit the height of soil stockpiles.
3. Limit the disturbance of soil stockpiles.
4. Keep the surface of stockpiles adequately wet.
5. All stockpiled soil shall be covered with plastic sheeting or other suitable cover material.
6. RECORD AND MONITOR ALL DUST PREVENTION/CONTROL ACTIVITIES. Recording this information will provide a superior method of monitoring and evaluating the success of the dust prevention and control plan.

In the event that visible dust is observed, associated work activities are to stop immediately and measures to mitigate commence as soon as possible (i.e., wetting down material with water).

5.0 HAZARD EVALUATION

5.1 Environmental Hazards

At present, suspected contaminants in the subsurface soil constitutes an environmental hazard. Various chemical compounds have been identified in the soil low concentrations. If encountered in the soil at higher concentrations than anticipated, exposure concerns could become a health issue. The following are known or suspected to be present at the site.

5.1.1 Volatile Organic Compounds (VOCs)

Volatile organic compounds (VOCs) such as benzene, toluene, and xylene (BTEX) have been identified in soil vapor samples at the site, and VOCs such as Acetone and Methylene Chloride have been identified in soil samples at the site. Should VOCs be detected during excavation, monitoring of the air using a PID will be performed. VOCs may cause chronic liver and kidney damage, and some are suspected human carcinogens. Benzene is a suspected human carcinogen. Acute exposure may include headache, dizziness, nausea, and skin and eye irritation. The primary route of exposure to VOCs is through inhalation; therefore, air monitoring and respiratory protection are the primary controls against exposure to VOCs.

5.1.2 Urban Historic Fill

Urban historic fill has been identified on the property. The urban historic fill is impacted with poly nuclear aromatic hydrocarbons (PAHs) and metals. PAHs, arsenic, mercury, copper, lead, nickel and zinc were detected over the New York State Department of Conservation's (NYSDEC's) Subpart 375-6 Track 1 Unrestricted Use Remedial Cleanup Objectives (RCO) in soil samples collected from the site.

Material Safety Data Sheets are provided in Attachment I for all compounds and analytes analyzed for as part of the investigation, including those compounds and analytes outlined above.

5.2 Physical Hazards

The work to be completed at the site in conjunction with this CHASP consists of installation of wells, piles and excavation for the installation of footings. Additional physical hazards expected on site include buried utilities, slip, trip, and fall hazards, and hazards associated with heavy machinery.

6.0 HAZARD MONITORING

6.1 Air Monitoring Using a PID

Periodic air monitoring and visual inspection of soil during well and pile installation as well as excavation for footings will be conducted. A PID will be used to screen both the soil and ambient air for the presence of VOCs.

The following are the Short Term (ST) Exposure Limits on a 15-minute time weighted average and the Immediate Danger to Life and Health (IDLH) conditions for VOCs which may be present in the subsurface soil. The levels are presented in parts per million (ppm).

Compound	ST	IDLH
Benzene	5 ppm	500 ppm
Ethyl benzene	100 ppm	500 ppm
Toluene	150 ppm	500 ppm
Xylenes	150 ppm	900 ppm

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area exceeds five (5) ppm above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below five (5) ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of five (5) ppm over background, but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or

half the distance to the nearest potential receptor or residential/commercial structure, whichever is less (but in no case less than 20 feet) is below five (5) ppm over background for the 15-minute average.

- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shut down.

All 15-minute readings will be recorded and be available review. Instantaneous readings, if any, used for decision purposes will also be recorded.

6.2 Air Monitoring Using a Dust Trak Monitor

Particulate concentrations will be monitored periodically both in the upwind and downwind directions at temporary particulate monitoring stations. The particulate monitoring will be performed using real-time monitoring equipment such as the Dust Trak Aerosol Monitor, Model 8530, capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work will be stopped and a reevaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

All readings will be recorded and be available for to review.

6.3 Personal Protective Equipment (PPE)

Based upon evaluation of potential hazards, the following levels of personal protection have been designated for the Work Area:

Location	Job Function	Level of Protection
Entire Site	Soil/Groundwater sampling	A B C [D]

If VOCs are detected which indicate a need to upgrade the PPE, the Health and Safety Officer will stop all work and evaluate the level of protection required to complete the project. A determination will be made regarding the safety of the situation and the type of PPE that will be

required. *At no time will work be conducted in an environment where an IDLH condition could be present.*

The following are monitoring levels for which a change in the level of protection or evacuation of the work area would be implemented. If the work area is evacuated, procedures such as the use of ventilation would be utilized if possible to lower monitoring levels to below the threshold for raising the level of protection.

PID	150 ppm

It should be noted that the work proposed will not be performed in a level of PPE other than Level D. Procedures would have to be put in place to lower the PPE requirement to Level D, should conditions suggest an increase in the level of PPE required.
Precautions will be implemented to limit direct contact with the soil or inhalation of dust. At a minimum, nitrile gloves are to be worn when handling soil, dust control procedures used if necessary, and thorough hand washing prior to handing food.

Specific protective equipment for potential levels of protection is as follows:

6.3.1 Levels A & B

Since levels A & B are for IDLH environments, they are not applicable to this project.

6.3.2 Level C

The concentration(s) and type(s) of airborne substance(s) is (are) known and the criteria for using air-purifying respirators are met. The following constitute Level C equipment:

- National Institute for Occupational Safety and Health (NIOSH)-approved full-face or half-face air purifying respirators;
- Chemical-resistant clothing (overalls, chemical-splash suit, disposable chemical-resistant overalls);
- Gloves, outer and inner, chemical-resistant;
- Boots, outer, chemical-resistant, with steel toe and shank;
- Optional chemical resistant boot covers;
- Hard hat;
- Safety glasses with side shields;
- Face shield and safety glasses when not wearing a full face respirator; and,
- Hearing protection when working in noise hazardous areas or near operating heavy equipment.

6.3.3 Level D

A work uniform providing no respiratory protection is used only for prevention of skin contamination. The following constitute Level D equipment:

- Coveralls or other skin-protective clothing (long-sleeve shirts and long pants);
- Gloves;

- Boots or shoes, chemical-resistant, steel toe and shank;
- Optional chemical resistant boot covers;
- Safety glasses or chemical splash goggles;
- Hard hat;
- Hearing protection when working in noise-hazardous areas or near operating heavy equipment; and,
- High-visibility safety vest.

NO CHANGES TO THE SPECIFIED LEVELS OF PROTECTION SHALL BE MADE WITHOUT THE APPROVAL OF THE CONSTRUCTION SITE SAFETY OFFICER.

7.0 COMMUNICATION PROCEDURES

The following standard hand signals will be used in case of emergency:

Message	**Interpretation(s)**
Hands gripping throat	Out of air; can't breathe.
Grip partner's wrist	Leave area immediately.
Hands on top of head	Need assistance.
Thumbs up	OK; I am all right; I understand.
Thumbs down	No; Negative.

8.0 DECONTAMINATION PROCEDURES

Should hazardous materials be encountered, a decontamination procedure will be implemented. Generated waste, such as disposable PPE, will be disposed of in accordance with applicable local, state, and federal regulations. The decontamination protocol shall be used with the following decontamination stations:

(1) Equipment drop;
(2) Detergent and Water Rinse (optional); and,
(3) Remove PPE (if utilized) and place in waste container

Decontamination of equipment is not anticipated to be required for this project.

9.0 MEDICAL MONITORING

As per 29 CFR 1910.120 (b)(4)(ii)(D) and in accordance with 29 CFR 1910.120 (f), persons engaging in on-site activities during which they are or may be exposed to hazardous substances or health hazards at or above the permissible exposure limits or published exposure levels for 30 days or more a year are included in a Medical Surveillance Program.

The timing and location of this project may be such that heat/cold stress could pose a threat to the health and safety of site personnel. Work/rest regimens will be employed as deemed

necessary by the Site Safety Officer so site workers do not suffer adverse effects from heat/cold stress. Special clothing and an appropriate diet and fluid intake will be recommended to all on-site personnel to further reduce these temperature-related hazards. Site workers should stop work and notify the Site Safety Officer when they observe symptoms of heat/cold stress in themselves or co-workers.

9.1 Heat Stress Monitoring

Heat stress monitoring of personnel wearing protective clothing (i.e., impermeable fabric) should be considered when the ambient temperature is 70 degrees Fahrenheit or above. To monitor the worker, one of the following methods should be employed:

- Heart rate should be measured by the radial pulse for a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 beats per minute, shorten the next work cycle by one-third (0.3) and keep the rest period the same. If the heart rate still exceeds 110 beats per minute at the next rest period, shorten the following cycle by one-third (0.3).
- Oral temperature should be measured at the end of the work period (before drinking). If oral temperature exceeds 99.6 degrees Fahrenheit, shorten the next work cycle by one-third (0.3) without changing the rest period. If the oral temperature still exceeds 99.6 degrees Fahrenheit at the beginning of the next rest period, shorten the next work cycle by one-third (0.3). Do not permit a worker to wear a semipermeable or impermeable garment when his/her oral temperature exceeds 100.6 degrees Fahrenheit.

9.2 Cold Stress Monitoring

Work/rest schedules must be altered to minimize the potential for cold stress. Cold stress is defined as a decrease in core body temperature to 96.8 degrees Fahrenheit and/or cold injury to body extremities. Decreases in core body temperature are associated with reduced mental alertness, reduction in rational decision-making, or loss of consciousness in severe cases. Symptoms of cold stress include pain in extremities (i.e., hands and feet) and severe shivering.

10.0 MEDICAL EMERGENCIES

10.1 Emergency Medical Care

- First Aid & Rescue Squad (Call 911).
- Montefiore Medical Center, 111 East 210 Street, Bronx, New York
- Phone: 718-920-7667

10.2 Directions to Montefiore Medical Center

See Attachment II for turn by turn driving directions and map.

10.3 List of Emergency Phone Numbers

Agency/Facility	Phone Number
All Services	911
Police	911
Fire Emergency	911
Montefiore Medical Center	718-920-7667

10.4 First Aid Equipment

First aid equipment is available on site at the following locations:

Equipment	Location
First Aid Kit	Field Vehicle
Fire Extinguisher	Field Vehicle

11.0 EMERGENCY PROCEDURES

On-site personnel will use the following standard emergency procedures. The Construction Health and Safety Officer shall be notified of on-site emergencies and be responsible for ensuring that the appropriate procedures are followed.

11.1 Personnel Injury in the Work Area

Upon notification of an injury in the Work Area, the Construction Health and Site Safety Officer will assess the nature of the injury. For a true emergency, 911 shall be called and local emergency services personnel shall initiate the appropriate first aid and contact the designated medical facility, if required.

If the cause of the injury or loss of the injured person does not affect the performance of site personnel, operations may continue with the local emergency services personnel initiating the appropriate first aid and necessary follow-up, as stated above. If the injury increases the risk to others, the designated emergency signal shall be sounded and all site personnel shall move to the site entrance for further instructions. Activities on site will stop until the added risk is removed or minimized. No persons shall reenter the Work Area until the cause of the symptoms or injury is determined by the Construction Health and Safety Officer.

11.2 Fire/Explosion

Upon notification of a fire or explosion on site, the designated emergency signal (three [3] horn blasts) shall be sounded, and all site personnel shall be assembled at the site entrance. The fire department shall be alerted, and all personnel shall be moved to a safe distance from the involved area.

11.3 PPE Failure

If utilization of PPE is necessitated by conditions in the Work Area and a site worker experiences a failure or alteration of protective equipment which affects the protection factor, that person shall immediately leave the Work Area. Reentry shall not be permitted until the equipment has been repaired or replaced.

11.4 Other Equipment Failure

If other equipment on site fails to operate properly, the Construction Health and Safety Officer shall be notified and then determine the effect of this failure on continuing operations. If the failure affects the safety of personnel or prevents completion of the planned tasks, all personnel shall leave the Work Area until the situation is evaluated and appropriate actions taken.

In all situations, when an on-site emergency results in evacuation of the Work Area, personnel shall not reenter until:

1. The conditions resulting in the emergency have been corrected.
2. The hazards have been reassessed.
3. The CHASP has been revised.
4. Site personnel have been briefed regarding changes in the CHASP.

12.0 SITE PERSONNEL SIGNATURE PAGE

ALL SITE PERSONNEL HAVE READ THE ABOVE HEALTH AND SAFETY PLAN AND ARE FAMILIAR AND WILL COMPLY WITH ITS PROVISIONS, AS EVIDENCED BY SIGNATURE BELOW.

Name	Signature	Date

Google earth

feet 1000

meters 500

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 03/18/2009
Print Date 10/16/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,1,1-Trichloroethane

Product Number : 402877
Brand : Sigma-Aldrich

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 'Chlorothene'
Methylchloroform

Formula : C2H3Cl3

CAS-No.	EC-No.	Index-No.	Concentration
1,1,1-Trichloroethane			
71-55-6	200-756-3	602-013-00-2	>= 99.8 %
Low alkyl epoxide			
-	-	-	<= 0.05 %

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Irritant, Teratogen, Reproductive hazard, Mutagen

Target Organs

Central nervous system, Cardiovascular system., Liver, Kidney

HMIS Classification
Health Hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating
Health Hazard: 3
Fire: 0

Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	no data available
Ignition temperature	537 °C (999 °F) -

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid inhalation of vapour or mist.
Normal measures for preventive fire protection.

Storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
1,1,1-Trichloroethane	71-55-6	TWA	350 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.				
		STEL	450 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.				
		TWA	350 ppm 1,900 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	450 ppm 2,450 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	350 ppm 1,900 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-35.0 °C (-31.0 °F)
Boiling point	72.0 - 75.0 °C (161.6 - 167.0 °F)
Flash point	no data available
Ignition temperature	537 °C (999 °F) -
Lower explosion limit	7.5 %(V)
Upper explosion limit	15 %(V)
Vapour pressure	133.3 hPa (100.0 mmHg) at 20.0 °C (68.0 °F)
Density	1.34 g/cm3
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents, Potassium, Magnesium, Sodium/sodium oxides, Zinc, Strong bases

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Contains the following stabiliser(s):
Low alkyl epoxide (<=0.05 %)

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 9,600 mg/kg
Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LC50 Inhalation - rat - 4 h - 18000 ppm

Irritation and corrosion

Skin - rabbit - Skin irritation - 24 h

Eyes - rabbit - Severe eye irritation - 24 h

Sensitisation

no data available

Chronic exposure

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (1,1,1-Trichloroethane)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Laboratory experiments have shown mutagenic effects.

Laboratory experiments have shown teratogenic effects.

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Signs and Symptoms of Exposure

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., prolonged or repeated exposure can cause:, narcosis, Liver injury may occur., Kidney injury may occur.

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.
Target Organs	Central nervous system, Cardiovascular system., Liver, Kidney,

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Bioaccumulation	Lepomis macrochirus (Bluegill) - 28 d Bioconcentration factor (BCF): 9

Ecotoxicity effects

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 53.00 mg/l - 96 h
	Growth inhibition NOEC - Cyprinus carpio (Carp) - 7.7 mg/l - 14 d
	LC50 - Pimephales promelas (fathead minnow) - 42.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 11.2 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Dangerous for the ozone layer.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2831 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: 1,1,1-TRICHLOROETHANE
Marine pollutant: No

IATA
UN-Number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane

15. REGULATORY INFORMATION

OSHA Hazards
Irritant, Teratogen, Reproductive hazard, Mutagen

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
Low alkyl epoxide	-

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/22/2006
Date Updated: 01/31/2006
Version 1.4

Section 1 - Product and Company Information

Product Name	4,4'-DDE PESTANAL,250 MG (2,2-BIS(4-CHL&
Product Number	35487
Brand	RIEDEL
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
2,2-BIS(4-CHLOROPHENYL)-1,1-DICHLOR O-ETHYLENE	72-55-9	No

Formula	C14H8Cl4
Synonyms	2,2-Bis(4-chlorophenyl)-1,1-dichloroethene * 2,2-Bis(p-chlorophenyl)-1,1-dichloroethylene * p,p'-Dde * DDT dehydrochloride * 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethylene * Dichlorodiphenyldichloroethylene * p,p'-Dichlorodiphenyl dichloroethylene * 1,1'-(Dichloroethenylidene)bis(4-chlorobenzene) * NCI-C00555
RTECS Number:	KV9450000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Harmful. Dangerous for the environment.
Harmful if swallowed. Limited evidence of a carcinogenic effect.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Possible Carcinogen (US). Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 1*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 1
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	318.03 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	88.0 - 90.0 °C	
Freezing Point	N/A	
Vapor Pressure	< 0.00001 mmHg	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 6.51	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents, Strong bases.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Hydrogen chloride gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: Harmful if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
880 mg/kg
LD50

Oral
Mouse
700 mg/kg
LD50

Oral
Hamster
> 5000 mg/kg
LD50

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Species: Mouse
Route of Application: Oral
Dose: 9700 MG/KG
Exposure Time: 78W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Species: Hamster
Route of Application: Oral
Dose: 36 GM/KG
Exposure Time: 86W
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors. Endocrine:Adrenal cortex tumors.

Species: Mouse
Route of Application: Oral
Dose: 28 GM/KG
Exposure Time: 80W
Frequency: C

Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 17 GM/KG
Exposure Time: 78W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Species: Hamster
Route of Application: Oral
Dose: 57 GM/KG
Exposure Time: 68W
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.
Endocrine:Adrenal cortex tumors.

Species: Hamster
Route of Application: Oral
Dose: 41 GM/KG
Exposure Time: 97W
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.
Endocrine:Adrenal cortex tumors.

Species: Hamster
Route of Application: Oral
Dose: 81 GM/KG
Exposure Time: 97W
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.
Endocrine:Adrenal cortex tumors.

IARC CARCINOGEN LIST

Rating: Group 2B

NTP CARCINOGEN LIST

Rating: Clear evidence.
Species: Mouse
Route: Feed

CHRONIC EXPOSURE - MUTAGEN

Species: Rat
Dose: 300 UMOL/L
Cell Type: liver
Mutation test: DNA damage

Species: Rat
Dose: 10 UG/L
Cell Type: Other cell types
Mutation test: Cytogenetic analysis

Species: Mouse
Dose: 42600 NMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Route: Oral

Dose: 200 MG/KG
Mutation test: Other mutation test systems

Species: Mouse
Route: Oral
Dose: 50 MG/KG
Mutation test: DNA inhibition

Species: Mouse
Dose: 25 MG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Hamster
Dose: 5 MG/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 20 MG/L
Cell Type: ovary
Mutation test: Mutation in mammalian somatic cells.

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 12375 UG/KG
Route of Application: Oral
Exposure Time: (8W PRE-21D POST)
Result: Effects on Newborn: Biochemical and metabolic.

Species: Rat
Dose: 3500 UG/KG
Route of Application: Intraperitoneal
Exposure Time: (7D PRE)
Result: Maternal Effects: Uterus, cervix, vagina.

Species: Rat
Dose: 3 GM/KG
Route of Application: Intraperitoneal
Exposure Time: (15D MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.
Paternal Effects: Other effects on male.

Section 12 - Ecological Information

ACCUMULATION

Bioaccumulation Potential: Indication of bioaccumulation.

ACUTE ECOTOXICITY TESTS
Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 0.2 - 0.3 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 0.026 - 0.040 mg/l

Test Type: LC50 Fish
Species: Salmon
Time: 96 h
Value: 0.050 - 0.180 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: Xn-N
Indication of Danger: Harmful. Dangerous for the environment.
R: 22-40-50/53
Risk Statements: Harmful if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 36/37-60-61
Safety Statements: Wear suitable protective clothing and gloves. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Harmful. Dangerous for the environment.
Risk Statements: Harmful if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Wear suitable protective clothing and gloves. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Possible Carcinogen (US). Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MATERIAL SAFETY DATA SHEET

Date Printed: 05/22/2006
Date Updated: 01/31/2006
Version 1.5

Section 1 - Product and Company Information

Product Name	4,4'-DDD PESTANAL,250 MG (2,2-BIS(4-CHL&
Product Number	35486
Brand	RIEDEL
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
2,2-BIS(4-CHLOROPHENYL)-1,1-DICHLOR O-ETHANE	72-54-8	No

Formula	C14H10Cl4
Synonyms	Benzene, 1,1'-(2,2-dichloroethylidene)bis(4-chloro- * 1,1-Bis(p-chlorophenyl)-2,2-dichloroethane * 1,1-Bis(4-chlorophenyl)-2,2-dichloroethane * 2,2-Bis(p-chlorophenyl)-1,1-dichloroethane * 2,2-Bis(4-chlorophenyl)-1,1-dichloroethane * DDD * p,p'-Ddd * 1,1-Dichloor-2,2-bis(4-chloor fenyl)-ethaan (Dutch) * 1,1-Dichlor-2,2-bis(4-chlor-phenyl)-aethan (German) * 1,1-Dichloro-2,2-bis(p-chlorophenyl)ethane * 1,1-Dichloro-2,2-bis(4-chlorophenyl)-ethane (French) * 1,1-Dichloro-2,2-bis(parachlorophenyl)ethane * 1,1-Dichloro-2,2-di(4-chlorophenyl)ethane * Dichlorodiphenyl dichloroethane * p,p'-Dichlorodiphenyldichloroethane * 1,1-Dicloro-2,2-bis(4-cloro-fenil)-etano (Italian * Dilene * ENT 4,225 * ME-1700 * NCI-C00475 * OMS 1078 * RCRA waste number U060 * Rhothane * Rhothane D-3 * Rothane * TDE * p,p'-TDE * Tetrachlorodiphenylethane
RTECS Number:	KI0700000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Calif. Prop. 65 carcinogen. Possible Carcinogen (US).

HMIS RATING
HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING
HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP

Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING

User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE

Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS

Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT

Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash contaminated clothing before reuse. Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance: Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	320.05 AMU	
pH	N/A	
BP/BP Range	193 °C	1 mmHg
MP/MP Range	94.0 - 96.0 °C	
Freezing Point	N/A	
Vapor Pressure	< 0.00001 mmHg	25 °C
Vapor Density	11 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.385 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 6.02	
Decomposition Temp.	N/A	
Flash Point	N/A	

Explosion Limits	N/A
Flammability	N/A
Autoignition Temp	N/A
Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Hydrogen chloride gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: Harmful if absorbed through skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Toxic if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
113 mg/kg
LD50

Skin
Rabbit
1200 mg/kg
LD50
Remarks: Behavioral:Convulsions or effect on seizure threshold. Behavioral:Excitement. Skin and Appendages:Skin: After topical exposure:Primary irritation.

Oral
Hamster
> 5000 mg/kg
LD50

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Oral
Dose: 54 GM/KG
Exposure Time: 78W
Frequency: C
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Endocrine:Thyroid tumors.

Species: Mouse
Route of Application: Oral
Dose: 39 GM/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Liver:Tumors.

IARC CARCINOGEN LIST

Rating: Group 2B

NTP CARCINOGEN LIST

Rating: Clear evidence.
Species: Rat
Route: Feed

CHRONIC EXPOSURE - MUTAGEN

Species: Rat
Dose: 10 UG/L
Cell Type: Other cell types
Mutation test: Cytogenetic analysis

Species: Mouse
Dose: 28400 NMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 1500 MG/KG
Cell Type: S. marcescens
Mutation test: Host-mediated assay

Section 12 - Ecological Information

ACCUMULATION

Bioaccumulation Potential: Indication of bioaccumulation.

ACUTE ECOTOXICITY TESTS
Test Type: EC50 Daphnia
Species: Daphnia pulex Daphnia magna
Time: 48 h
Value: 0.009 mg/l

Test Type: LC50 Fish
Species: other fish
Time: 96 h
Value: 1.180 - 9.0 mg/l

Test Type: LC50 Fish

Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 0.040 - 0.050 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 0.060 - 0.090 mg/l

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 3.470 - 5.580 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Organochlorine pesticides, solid toxic
UN#: 2761
Class: 6.1
Packing Group: Packing Group III
Hazard Label: Toxic Substance
PIH: Not PIH

IATA
Proper Shipping Name: Organochlorine pesticide, solid, toxic
IATA UN Number: 2761
Hazard Class: 6.1
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 21-25-40-50/53
Risk Statements: Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 36/37-45-60-61
Safety Statements: Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: Harmful in contact with skin. Toxic if

swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Calif. Prop. 65 carcinogen. Possible Carcinogen (US).

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.1
Revision Date 07/09/2009
Print Date 10/23/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,4-Dioxane

Product Number : 42500
Brand : Fluka

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Dioxane
Diethylene oxide

Formula : $C_4H_8O_2$
Molecular Weight : 88.11 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
1,4-Dioxane			
123-91-1	204-661-8	603-024-00-5	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable Liquid, Target Organ Effect, Irritant, Carcinogen

Target Organs

Liver, Kidney, Central nervous system

Other hazards which do not result in classification
May form explosive peroxides.

HMIS Classification
Health Hazard: 2
Chronic Health Hazard: *
Flammability: 3
Physical hazards: 0

NFPA Rating
Health Hazard: 2

Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation. Repeated exposure may cause skin dryness or cracking.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	12 °C (54 °F) - closed cup
Ignition temperature	180 °C (356 °F)

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods for cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
1,4-Dioxane	123-91-1	TWA	20 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Liver damage Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is lilkely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure. Danger of cutaneous absorption				
		TWA	25 ppm 90 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation				
		TWA	100 ppm 360 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Skin designation The value in mg/m3 is approximate.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	colourless

Safety data

pH	6.0 - 8 at 500 g/l at 20 °C (68 °F)
Melting point	10 - 12 °C (50 - 54 °F) - lit.
Boiling point	100 - 102 °C (212 - 216 °F) - lit.
Flash point	12 °C (54 °F) - closed cup
Ignition temperature	180 °C (356 °F)
Lower explosion limit	2 %(V)
Upper explosion limit	22 %(V)
Vapour pressure	36 hPa (27 mmHg) at 20 °C (68 °F) 53 hPa (40 mmHg) at 25.20 °C (77.36 °F)
Density	1.034 g/mL at 25 °C (77 °F)
Water solubility	completely miscible
Partition coefficient: n-octanol/water	log Pow: -0.27
Relative vapour density	3.04 - (Air = 1.0)

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Oxygen, Oxidizing agents, Halogens, Reducing agents, Perchlorates., Trimethylaluminum

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Hazardous reactions
Vapours may form explosive mixture with air.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 4,200 mg/kg

LC50 Inhalation - rat - 2 h - 46,000 mg/m3
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Other.

LD50 Dermal - rabbit - 7,858 mg/kg

Irritation and corrosion

Skin - Human -
Remarks: Chronic exposure causes drying effect on the skin and eczema.

Skin - rabbit - No skin irritation

Eyes - rabbit - Eye irritation - 24 h

Sensitisation

no data available

Chronic exposure

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (1,4-Dioxane)
NTP:	Reasonably anticipated to be a human carcinogen (1,4-Dioxane)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Laboratory experiments have shown mutagenic effects.

Signs and Symptoms of Exposure

Nausea, Vomiting, Weakness, Dizziness, Vertigo, Headache, Sweating, loss of appetite, Kidney injury may occur., Liver injury may occur.

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation. Repeated exposure may cause skin dryness or cracking.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.
Target Organs	Liver, Kidney, Central nervous system,

Additional Information
RTECS: JG8225000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Biodegradability	Result: < 5 % - Not readily biodegradable.

Ecotoxicity effects

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 985 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 8,450 mg/l - 24 h
Toxicity to algae	EC50 - Scenedesmus subspicatus - > 500 mg/l - 72 h

Further information on ecology

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1165 Class: 3 Packing group: II
Proper shipping name: Dioxane
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1165 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: DIOXANE
Marine pollutant: No

IATA
UN-Number: 1165 Class: 3 Packing group: II
Proper shipping name: Dioxane

15. REGULATORY INFORMATION

OSHA Hazards
Flammable Liquid, Target Organ Effect, Irritant, Carcinogen

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
1,4-Dioxane	123-91-1	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,4-Dioxane	123-91-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,4-Dioxane	123-91-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,4-Dioxane	123-91-1	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause cancer. 1,4-Dioxane	123-91-1	2007-09-28

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 12/28/2008
Print Date 10/29/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,4-Dichlorobenzene

Product Number : 35370
Brand : Fluka

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C6H4Cl2
Molecular Weight : 147 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
1,4-Dichlorobenzene			
106-46-7	203-400-5	602-035-00-2	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Toxic by ingestion, Carcinogen

Target Organs

Liver, Kidney, Blood, Nerves.

HMIS Classification

Health Hazard: 2
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating

Health Hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.
Ingestion Toxic if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties
Flash point 66.0 °C (150.8 °F) - closed cup

Ignition temperature no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
1,4-	106-46-7	TWA	10 ppm	1994-09-01	US. American Conference

Dichlorobenzene			60 mg/m3		of Governmental and Industrial Hygienists Threshold Limit Values for Chemical Substances in the Work Environment; Annual Reports for the Year 2004:Committees on Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)
Remarks	Confirmed animal carcinogen with unknown relevance to humans. Refers to Appendix A -- Carcinogens.				
		TWA	75 ppm 450 mg/m3	1989-03-01	US. Department of Labor - Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1000 Z-1-A
		STEL	110 ppm 675 mg/m3	1989-03-01	US. Department of Labor - Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1000 Z-1-A
		TWA	75 ppm 450 mg/m3	1993-06-30	US. Department of Labor - Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL) 29 CFR 1910.1000 Air Contaminants.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form sheets

Colour	colourless

Safety data

pH	no data available
Melting point	52.0 °C (125.6 °F)
Boiling point	172.0 - 173.0 °C (341.6 - 343.4 °F)
Flash point	66.0 °C (150.8 °F) - closed cup
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	8.8 hPa (6.6 mmHg) at 50.0 °C (122.0 °F) 0.5 hPa (0.4 mmHg) at 25.0 °C (77.0 °F)
Density	1.24 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 3.40

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 500.0 mg/kg

LD50 Dermal - rabbit - > 2,000 mg/kg

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	Group 2B - The agent (mixture) is possibly carcinogenic to humans. (1,4-Dichlorobenzene)
NTP:	Reasonably anticipated to be human carcinogens. (1,4-Dichlorobenzene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

Produces:, methemoglobin, Nausea, Vomiting, Increased pulse rate, Headache, Impairment of vision

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Toxic if swallowed.
Target Organs	Liver, Kidney, Blood, Nerves.,

Additional Information
RTECS: CZ4550000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Biodegradability	aerobic Result: 20 % - Not readily biodegradable.
Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 7 d Bioconcentration factor (BCF): 112

Ecotoxicity effects

Toxicity to fish	LC50 - Brachydanio rerio (zebra fish) - 2.10 mg/l - 96 h
	LC50 - Pimephales promelas (fathead minnow) - 4.20 mg/l - 96 h
	LOEC - other fish - 0.263 mg/l - 10 d
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 5.6 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 0.70 mg/l - 48 h
Toxicity to algae	EC50 - Scenedesmus subspicatus - 28.00 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (1,4-Dichlorobenzene)
Marine pollutant: Marine pollutant

Poison Inhalation Hazard: No

IMDG
UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (1,4-Dichlorobenzene)
Marine pollutant: Marine pollutant

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid n.o.s. (1,4-Dichlorobenzene)

15. REGULATORY INFORMATION

OSHA Hazards
Toxic by ingestion, Carcinogen

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
1,4-Dichlorobenzene	106-46-7	1987-01-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,4-Dichlorobenzene	106-46-7	1987-01-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,4-Dichlorobenzene	106-46-7	1987-01-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,4-Dichlorobenzene	106-46-7	1987-01-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause cancer. 1,4-Dichlorobenzene	106-46-7	1990-06-15

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 12/31/2008
Print Date 10/23/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,3-Dichlorobenzene

Product Number : 35350
Brand : Aldrich

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_6H_4Cl_2$
Molecular Weight : 147.00 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
1,3-Dichlorobenzene			
541-73-1	208-792-1	602-067-00-7	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

HMIS Classification
Health Hazard: 1
Flammability: 2
Physical hazards: 0

NFPA Rating
Health Hazard: 1
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	67.0 °C (152.6 °F) - closed cup
Ignition temperature	no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	25 °C (77 °F)
Boiling point	172 - 173 °C (342 - 343 °F)
Flash point	67.0 °C (152.6 °F) - closed cup
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1.288 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Intraperitoneal - mouse - 1,062 mg/kg

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

Additional Information
RTECS: CZ4499000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Bioaccumulation	Pimephales promelas (fathead minnow) - 32 d Bioconcentration factor (BCF): 97

Ecotoxicity effects

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 7.8 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	LC50 - Daphnia magna (Water flea) - 1.7 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, liquid, n.o.s. (1,3-Dichlorobenzene)
Marine pollutant: Marine pollutant
Poison Inhalation Hazard: No

IMDG
UN-Number: 3082 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S. (1,3-Dichlorobenzene)
Marine pollutant: Marine pollutant

IATA
UN-Number: 3082 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, liquid n.o.s. (1,3-Dichlorobenzene)

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	1987-01-01

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	1987-01-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	1987-01-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,3-Dichlorobenzene	541-73-1	1987-01-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information
Copyright 2008 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/24/2006
Date Updated: 02/09/2006
Version 1.4

Section 1 - Product and Company Information

Product Name	1,3,5-TRIMETHYLBENZENE SINGLE COMPONENT
Product Number	41103
Brand	SIGMA
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,3,5-TRIMETHYLBENZENE	108-67-8	No

Formula	C9H12
Synonyms	Benzene, 1,3,5-trimethyl- * 3,5-Dimethyltoluene * Fleet-X * sym-Trimethylbenzene * 1,3,5-Trimethylbenzene * Trimethylbenzol
RTECS Number:	OX6825000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Combustible (USA) Flammable (EU). Irritant. Dangerous for the environment.
Irritating to respiratory system and skin. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target organ(s): Nerves. Blood.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 2
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 2
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT
127.4 °F 53 °C Method: closed cup

EXPLOSION LIMITS
Lower: 0.88 %

AUTOIGNITION TEMP
550 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Combustible liquid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from heat and open flame.
Store at 2-8°C

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
New Zealand	OEL		

Remarks: check ACGIH TLV

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	100 mg/m3
Poland		NDSCh	170 mg/m3
Poland		NDSP	

Section 9 - Physical/Chemical Properties

Appearance
Physical State: Clear liquid
Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	120.2 AMU	
pH	N/A	
BP/BP Range	165 °C	
MP/MP Range	- 45.0 °C	
Freezing Point	N/A	
Vapor Pressure	2.49 mmHg	25 °C
Vapor Density	4.1 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	0.865 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	

Flash Point	127.4 °F 53 °C	Method: closed cup
Explosion Limits	Lower: 0.88 %	
Flammability	N/A	
Autoignition Temp	550 °C	
Refractive Index	1.498	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: May be harmful if inhaled. Vapor or mist is irritating to the mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Blood. Central nervous system. Peripheral nervous system.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Inhalation
Rat
24,000 mg/m3
LC50

IRRITATION DATA

Skin
Rabbit
20 mg
24H
Remarks: Moderate irritation effect

Eyes
Rabbit
500 mg
24H
Remarks: Mild irritation effect

CHRONIC EXPOSURE - MUTAGEN

Species: Mouse
Route: Intraperitoneal
Dose: 1800 MG/KG
Mutation test: Sister chromatid exchange

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: 1,3,5-Trimethylbenzene
UN#: 2325
Class: 3
Packing Group: Packing Group III
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: 1,3,5-Trimethylbenzene
IATA UN Number: 2325
Hazard Class: 3
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: Xi-N
Indication of Danger: Irritant. Dangerous for the environment.
R: 10-37-51/53
Risk Statements: Flammable. Irritating to respiratory system. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 61
Safety Statements: Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Combustible (USA) Flammable (EU). Irritant. Dangerous for the environment.
Risk Statements: Irritating to respiratory system and skin. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Target organ(s): Nerves. Blood.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: Yes

NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2006 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

Material Safety Data Sheet
1,2-Dichloroethane

ACC# 09390

Section 1 - Chemical Product and Company Identification

MSDS Name: 1,2-Dichloroethane
Catalog Numbers: AC113360000, AC113360010, AC113360025, AC113360250, AC113361000, AC326840000, AC326840010, AC326841000, AC326842500, AC327860000, AC327860010, AC406800000, AC406800010, AC406800040, AC406800200, AC406810000, AC406810010, AC406810030, AC406810500, AC406815000, AC406820000, AC406820040, AC406820250, AC406825000, AC406830000, AC406835000, S79997, BP1100-500, E175-20, E175-4, E175-500, E175J4, E175RS19, E175RS50, E190-4
Synonyms: Ethylene dichloride; 1,2-Ethylene dichloride; Glycol dichloride; EDC; sym-Dichloroethane; 1,2-Dichloroethane; Ethylene chloride.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
107-06-2	1,2-Dichloroethane	>99	203-458-1

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless liquid. Flash Point: 56 deg F.
Warning! Flammable liquid and vapor. Causes eye, skin, and respiratory tract irritation. May be harmful if swallowed. May cause central nervous system depression. May cause cancer based on animal studies. May cause liver damage.
Target Organs: Central nervous system, liver, respiratory system, eyes, skin.

Potential Health Effects

Eye: Causes eye irritation. Vapors may cause eye irritation.
Skin: Causes skin irritation. May be absorbed through the skin.
Ingestion: May cause central nervous system depression, kidney damage, and liver damage. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause effects similar to those for inhalation exposure.
Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory

tract irritation. May cause liver and kidney damage. Vapors may cause dizziness or suffocation. Can produce delayed pulmonary edema. Exposure to high concentrations may produce narcosis, nausea and loss of consciousness.
Chronic: Possible cancer hazard based on tests with laboratory animals. Prolonged or repeated skin contact may cause dermatitis. Prolonged or repeated eye contact may cause conjunctivitis. May cause liver and kidney damage. Effects may be delayed.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Never give anything by mouth to an unconscious person. Get medical aid. Do NOT induce vomiting. If conscious and alert, rinse mouth and drink 2-4 cupfuls of milk or water.
Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid. Do NOT use mouth-to-mouth resuscitation.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. For large fires, use water spray, fog, or alcohol-resistant foam. Water may be ineffective. Do NOT use straight streams of water.
Flash Point: 56e deg F (13.33 deg C)
Autoignition Temperature: 775 deg F (412.78 deg C)
Explosion Limits, Lower:6.2%
Upper: 15.9%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. A vapor suppressing foam may be used to reduce vapors.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Keep away from heat, sparks and flame. Avoid breathing vapor or mist.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances. Flammables-area. Storage under a nitrogen blanket has been recommended.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local explosion-proof ventilation to keep airborne levels to acceptable levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2-Dichloroethane	10 ppm TWA	1 ppm TWA; 4 mg/m3 TWA 50 ppm IDLH	50 ppm TWA; 100 ppm Ceiling

OSHA Vacated PELs: 1,2-Dichloroethane: 1 ppm TWA; 4 mg/m3 TWA
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: colorless
Odor: chloroform-like
pH: Not available.
Vapor Pressure: 100 mm Hg @29 deg C
Vapor Density: 3.4 (Air=1)
Evaporation Rate:6.5 (Butyl acetate=1)
Viscosity: Not available.
Boiling Point: 81 - 85 deg C
Freezing/Melting Point:-35 deg C
Decomposition Temperature: Not available.
Solubility: Insoluble.
Specific Gravity/Density:1.25 (Water=1)
Molecular Formula:$C_2H_4Cl_2$

Molecular Weight:98.96

Section 10 - Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions.
Conditions to Avoid: Light, ignition sources, excess heat, electrical sparks.
Incompatibilities with Other Materials: Aluminum, bases, alkali metals, ketones, organic peroxides, nitric acid, strong oxidizing agents, strong reducing agents, liquid ammonia, amines.
Hazardous Decomposition Products: Hydrogen chloride, phosgene, carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 107-06-2: KI0525000
LD50/LC50:
CAS# 107-06-2:
Draize test, rabbit, eye: 63 mg Severe;
Draize test, rabbit, eye: 500 mg/24H Mild;
Draize test, rabbit, skin: 500 mg/24H Mild;
Inhalation, mouse: LC50 = 1060 mg/m3/6H;
Inhalation, rat: LC50 = 1000 ppm/7H;
Inhalation, rat: LC50 = 5100 mg/m3/6H;
Oral, mouse: LD50 = 413 mg/kg;
Oral, mouse: LD50 = 413 mg/kg;
Oral, rabbit: LD50 = 860 mg/kg;
Oral, rabbit: LD50 = 0.7 mL/kg;
Oral, rat: LD50 = 500 mg/kg;
Skin, rabbit: LD50 = 2800 mg/kg;
.

Carcinogenicity:
CAS# 107-06-2:

- **ACGIH:** Not listed.
- **California:** carcinogen, initial date 10/1/87
- **NTP:** Suspect carcinogen
- **IARC:** Group 2B carcinogen

Epidemiology: See actual RTECS.
Teratogenicity: See actual entry in RTECS for complete information.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea Daphnia: 218mg/L; 48H; Fish: Bluegill/Sunfish: 430mg/L; 96H; StaticFish: Fathead Minnow: 136mg/L; 96H; Static No data available.
Environmental: Terrestrial: Smaller releases on land will evaporate fairly rapidly. Larger releases may leach rapidly through sandy soil into groundwater. Aquatic: If released to surface water, its primary loss will be by evaporation. The half-life for evaporation will depend on wind and mixing conditions and was of the order of hours in the laboratory. However a modeling study using the EXAMS model for a eutrophic lake gave a half-life of 10 days. Atmospheric: Will degrade by reaction with hydroxyl radicals formed photochemically in the atmosphere. Half-life over one month.
Physical: Not expected to biodegrade or bioconcentrate.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 107-06-2: waste number U077.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ETHYLENE DICHLORIDE	ETHYLENE DICHLORIDE
Hazard Class:	3	3(6.1)
UN Number:	UN1184	UN1184
Packing Group:	II	II
Additional Info:		FLASHPOINT 13 C

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 107-06-2 is listed on the TSCA inventory.
Health & Safety Reporting List
CAS# 107-06-2: Effective 6/1/87, Sunset 6/1/97
Chemical Test Rules
CAS# 107-06-2: 40 CFR 799.5115
Section 12b
CAS# 107-06-2: Section 4
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 107-06-2: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 107-06-2: immediate, delayed, fire.

Section 313

This material contains 1,2-Dichloroethane (CAS# 107-06-2, >99%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR

Clean Air Act:

CAS# 107-06-2 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 107-06-2 is listed as a Hazardous Substance under the CWA. CAS# 107-06-2 is listed as a Priority Pollutant under the Clean Water Act. CAS# 107-06-2 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 107-06-2 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:

WARNING: This product contains 1,2-Dichloroethane, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 107-06-2: 10 æg/day NSRL

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T F

Risk Phrases:

R 11 Highly flammable.
R 22 Harmful if swallowed.
R 36/37/38 Irritating to eyes, respiratory system and skin.
R 45 May cause cancer.

Safety Phrases:

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.

WGK (Water Danger/Protection)

CAS# 107-06-2: 3

Canada - DSL/NDSL

CAS# 107-06-2 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of B2, D1B, D2A.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 107-06-2 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 12/12/1997
Revision #10 Date: 6/07/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Version 4.0
Revision Date 03/13/2010
Print Date 10/18/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	1,2-Dichlorobenzene
Product Number	:	240664
Brand	:	Sigma-Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Target Organ Effect, Toxic by ingestion, Irritant

Target Organs

Liver, Kidney, Central nervous system

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H227	Combustible liquid
H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H371	May cause damage to organs.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	1

NFPA Rating

Health hazard:	2
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_6H_4Cl_2$

Molecular Weight : 147.00 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
1,2-Dichlorobenzene			
95-50-1	202-425-9	602-034-00-7	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Light sensitive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
1,2-Dichlorobenzene	95-50-1	TWA	25 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Eye & Upper Respiratory Tract irritation Liver damage Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.				
		STEL	50 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Eye & Upper Respiratory Tract irritation Liver damage Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.				
		C	50 ppm 300 mg/m3	2006-02-28	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate. Ceiling limit is to be determined from breathing-zone air samples.				
		C	50 ppm 300 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-18 - -17 °C (0 - 1 °F) - lit.

Boiling point	178 - 180 °C (352 - 356 °F) - lit.
Flash point	66.0 °C (150.8 °F) - closed cup
Ignition temperature	648 °C (1,198 °F)
Lower explosion limit	2.2 %(V)
Upper explosion limit	9.2 %(V)
Vapour pressure	2.1 hPa (1.6 mmHg) at 35.0 °C (95.0 °F) 1.6 hPa (1.2 mmHg) at 20.0 °C (68.0 °F)
Density	1.306 g/cm3 at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 500.0 mg/kg

LD50 Dermal - rabbit - > 10,000 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (1,2-Dichlorobenzene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
May cause damage to organs.

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Additional Information
RTECS: CZ4500000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.58 mg/l - 96.0 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 9.7 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 0.74 mg/l - 48 h
Toxicity to algae	Growth inhibition LOEC - Desmodesmus subspicatus (green algae) - 50 mg/l - 72 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 14 d Bioconcentration factor (BCF): 89

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1591 Class: 6.1 Packing group: III
Proper shipping name: o-Dichlorobenzene
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1591 Class: 6.1 Packing group: III EMS-No: F-A, S-A

Proper shipping name: ortho-DICHLOROBENZENE
Marine pollutant: No

IATA
UN-Number: 1591 Class: 6.1 Packing group: III
Proper shipping name: o-Dichlorobenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Target Organ Effect, Toxic by ingestion, Irritant

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
1,2-Dichlorobenzene	95-50-1	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2-Dichlorobenzene	95-50-1	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2-Dichlorobenzene	95-50-1	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2-Dichlorobenzene	95-50-1	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 08/22/2009
Print Date 10/20/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : 1,2,4-Trimethylbenzene

Product Number : P3394
Brand : Sigma

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Pseudocumene

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
1,2,4-Trimethylbenzene			
95-63-6	202-436-9	601-043-00-3	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

Target Organs

Central nervous system

HMIS Classification
Health Hazard: 1
Chronic Health Hazard: *
Flammability: 2
Physical hazards: 0

NFPA Rating
Health Hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	48.0 °C (118.4 °F) - closed cup
Ignition temperature	515 °C (959 °F)

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
1,2,4-Trimethylbenzene	95-63-6	TWA	25 ppm 125 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	25 ppm 123 mg/m3	1994-09-01	USA. ACGIH Threshold Limit Values (TLV)

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	light blue colourless

Safety data

pH	no data available
Melting point	-44 °C (-47 °F) - lit.
Boiling point	168 °C (334 °F) - lit.
Flash point	48.0 °C (118.4 °F) - closed cup
Ignition temperature	515 °C (959 °F)
Lower explosion limit	0.9 %(V)
Upper explosion limit	6.4 %(V)

Vapour pressure	2.3 hPa (1.7 mmHg) at 20.0 °C (68.0 °F) 6.0 hPa (4.5 mmHg) at 37.7 °C (99.9 °F) 9.3 hPa (7.0 mmHg) at 44.4 °C (111.9 °F)
Density	0.876 g/mL at 20 °C (68 °F)
Water solubility	insoluble

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Hazardous reactions
Vapours may form explosive mixture with air.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 5,000 mg/kg

LC50 Inhalation - rat - 4 h - 18,000 mg/m3

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

prolonged or repeated exposure can cause:, narcosis, Bronchitis., Symptoms and signs include headache, dizziness, fatigue, muscular weakness, drowsiness and in extreme cases, loss of consciousness., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.

Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.
Target Organs	Central nervous system,

Additional Information
RTECS: DC3325000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 7.72 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 3.6 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid, n.o.s.
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 3295 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: HYDROCARBONS, LIQUID, N.O.S.
Marine pollutant: No

IATA
UN-Number: 3295 Class: 3 Packing group: III
Proper shipping name: Hydrocarbons, liquid n.o.s.

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,2,4-Trimethylbenzene	95-63-6	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information
Copyright 2009 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 04/05/2011
Print Date 06/29/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	1,1-Dichloroethene
Product Number	:	48526
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Target Organ Effect, Toxic by ingestion, Irritant

Target Organs

Liver, Kidney, Central nervous system

GHS Classification
Flammable liquids (Category 1)
Acute toxicity, Oral (Category 3)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Carcinogenicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H224	Extremely flammable liquid and vapour.
H301	Toxic if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H351	Suspected of causing cancer.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P281	Use personal protective equipment as required.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical hazards:	2

NFPA Rating

Health hazard:	2
Fire:	4
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,1-Dichloroethylene
Vinylidene chloride

Formula : $C_2H_2Cl_2$
Molecular Weight : 96.94 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Vinylidene chloride			
75-35-4	200-864-0	602-025-00-8	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature: 2 - 8 °C

Air and moisture sensitive. Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Remarks	Potential Occupational Carcinogen See Appendix A			
Vinylidene chloride	75-35-4	TWA	5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Liver & kidney damage Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.			
		TWA	1 ppm 4 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific

workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -122 °C (-188 °F) - lit.
Boiling point	30 - 32 °C (86 - 90 °F) - lit.
Flash point	-25.0 °C (-13.0 °F) - closed cup
Ignition temperature	520 °C (968 °F)
Autoignition temperature	520.0 °C (968.0 °F) 580.0 °C (1,076.0 °F)
Lower explosion limit	6.5 %(V)
Upper explosion limit	15.5 %(V)
Vapour pressure	658.6 hPa (494.0 mmHg) 667.3 hPa (500.5 mmHg) at 20.0 °C (68.0 °F) 2,137.4 hPa (1,603.2 mmHg) at 55.0 °C (131.0 °F)
Density	1.213 g/cm3 at 20 °C (68 °F)
Water solubility	0.2 g/l at 20 °C (68 °F)
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Oxidizing agents, Copper, Aluminum, and its alloys, Peroxides, Strong bases, Oxygen

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 200.0 mg/kg

Inhalation LC50
Lung irritation

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Vinylidene chloride)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Nausea, Headache, Vomiting, Dizziness, Drowsiness, Confusion., Incoordination., Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: KV9275000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Daphnia magna (Water flea) - 11.60 - 11.79 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108.00 - 169.00 mg/l
	LC50 - Lepomis macrochirus (Bluegill) - 74.00 - 220.00 mg/l
	LC50 - Cyprinodon variegatus (sheepshead minnow) - 249.00 mg/l
	LC50 - other fish - 250.00 mg/l
	LC50 - other fish - 224.00 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 80 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	LC50 - Daphnia magna (Water flea) - 11.6 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1303 Class: 3 Packing group: I EMS-No: F-E, S-D
Proper shipping name: VINYLIDENE CHLORIDE, STABILIZED
Marine pollutant: No

IATA
UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Target Organ Effect, Toxic by ingestion, Irritant

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
Copyright 2011 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Avocado Research Chemicals Ltd - Material Safety Data Sheet 19318

1. IDENTIFICATION OF SUBSTANCE AND SUPPLIER

Name On Label 1,1-Dichloroethane
Product Number 19318
Supplier Johnson Matthey Catalog Company Inc.
30 Bond Street, Ward Hill, Massachusetts, 01835-8099
Emergency Telephone Number: (978) 521-6300; CHEMTREC: (800) 424-9300

Alternative Names None in common use.

2. COMPOSITION AND INFORMATION ON COMPONENTS

Name 1,1-Dichloroethane
Minor Impurities Not determined
CAS No. 75-34-3 **EINECS No.** 2008635 **EEC No.**

3. HAZARDS IDENTIFICATION

Designation HIGHLY FLAMMABLE ~ POSSIBLE CARCINOGEN ~ IRRITANT

Risk Phrases
R45 May cause cancer.
R11 Highly flammable.
R36/37/38 Irritating to eyes, respiratory system and skin.

4. FIRST AID MEASURES

Inhalation Remove to fresh air. If breathing is difficult give oxygen and seek medical attention.
Eye Contact Flush with copious amounts of water for at least 15 minutes. If irritation persists, seek medical attention.
Skin Contact Remove contaminated clothing. Wash affected area with soap and water. Rinse thoroughly. If irritation persists or other symptoms are observed, seek medical advice.
Ingestion Rinse out mouth and drink lots of water. In case of irritation or other symptoms, seek medical attention.

5. FIRE FIGHTING MEASURES

Extinguishing Medium Use fire fighting measures which suit the environment and take into account other materials which may be involved. In general, water-based extinguishers should not be used for fires involving organic materials. Use carbon dioxide or dry powder.
Protective Equipment Wear self-contained breathing apparatus and protective clothing.

Hazardous Products of Combustion may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).

6. ACCIDENTAL RELEASE MEASURES

Personal Protection Keep away from ignition sources. Avoid inhalation of vapour. Wear protective equipment including rubber gloves, eye protection and breathing equipment. Keep unprotected persons away.
Environmental Protection Take precautions to ensure product does not contaminate the ground or enter the drainage system.
Collection Absorb in vermiculite or proprietary absorbent material and transfer to sealed containers for disposal.

7. HANDLING AND STORAGE

Handling Chemicals should be used only by those trained in handling potentially hazardous materials. Rubber gloves, eye protection and protective clothing should be worn. Operations should be carried out in an efficient fume hood or equivalent system.
Storage Store in tightly sealed containers in a cool place.
Protect from moisture.

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory Volatile product. Avoid inhalation of vapour. Handle in an efficient fume hood or equivalent system.
Eye Avoid eye contact. Wear safety spectacles, goggles or, for larger quantities, a full face mask.
Hands and Body Irritant product. Avoid skin contact. Wear rubber gloves, protective clothing and, for larger quantities, full arm, body and face protection. Wash hands thoroughly after handling.

Continued on next page...

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Colorless to faint-yellow liquid		
Physical Constants	b.p. 56-58˚		
Molecular formula	$C_2H_4Cl_2$	**Formula Wt.**	98.96
Water solubility	Sl sol	**Density**	1.17
Flash Point	Not available		

10. STABILITY AND REACTIVITY

Specific Hazard

Incompatibilities	Strong oxidising agents.
Decomposition	Hazardous products of decomposition may include: carbon monoxide, carbon dioxide, hydrogen chloride (hydrochloric acid).

11. TOXICOLOGICAL INFORMATION

RTECS No.	KI0175000
Acute Toxicity	LD_{50}: ORL-RAT 725mg/kg May cause cancer. Irritating to eyes, respiratory system and skin.
Special Note	Exposure can give rise to dermatitis and hypersensitivity.
Chronic Toxicity	Carcinogen. Possible teratogen.

12. ECOLOGICAL EFFECTS

General	Take care to prevent chemicals from entering the ground, water courses or drainage systems.

13. DISPOSAL CONSIDERATIONS

Disposal	Disposal should be via an approved contractor and should take full account of local regulations.

14. TRANSPORT INFORMATION

UN Number	2362		
Land Transport	ADR/RIC Code/Class	3.2	Packing Group II
Maritime Transport	IMDG Code/Class	3.2	Packing Group II
Air Transport	IATA Code/Class	3.2	Packing Group II

15. REGULATORY INFORMATION

CAS No. 75-34-3 **EINECS No.** 2008635 **EEC No.** **UN No.** 2362 **RTECS No.** KI0175000

Hazard Indication	HIGHLY FLAMMABLE ~ POSSIBLE CARCINOGEN ~ IRRITANT
Risk & Safety Phrases	May cause cancer. Highly flammable. Irritating to eyes, respiratory system and skin. Avoid exposure - obtain special instructions before use. Keep away from sources of ignition - No Smoking. Wear suitable protective clothing, gloves and eye/face protection.
TSCA	Listed substance.

16. OTHER INFORMATION

It must be recognised that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Date of Last Review: 3rd August 1998 **Date Printed:** 18th September 1998

MATERIAL SAFETY DATA SHEET

Date Printed: 10/23/2010
Date Updated: 01/30/2006
Version 1.7

Section 1 - Product and Company Information

Product Name	4,4'-DDT PESTANAL (1,1,1-TRICHLORO-2,2-&
Product Number	35491
Brand	RIEDEL
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,1-BIS(4-CHLOROPHENYL)-2,2,2-TRICHLORO-ETHANE	50-29-3	No

Formula	C14H9Cl5
Synonyms	Aavero-extra * Agritan * Arkotine * Azotox * Benzene, 1,1'-(2,2,2-trichloroethylidene)bis(4-chloro- * Benzochloryl * alpha,alpha-Bis(p-chlorophenyl)-beta,beta,beta-trichlorethane * 1,1-Bis-(p-chlorophenyl)-2,2,2-trichloroethane * 2,2-Bis(p-chlorophenyl)-1,1,1-trichloroethane * Bosan Supra * Bovidermol * Chlorophenothan * Chlorophenothane * Chlorophenotoxum * Citox * Clofenotane * DDT * DDT (ACGIH:OSHA) * Azotox M 33 * Deoval * Detox * Detoxan * Dibovin * Dichlorodiphenyltrichloroethane * Dichlorodiphenyltrichloroethane (ACGIH:OSHA) * p,p'-Dichlorodiphenyltrichloroethane * 4,4'-Dichlorodiphenyltrichloroethane * Dicophane * Dodat * Dykol * ENT 1,506 * Estonate * Gesafid * Gesarol * Hildit * Ivoran * Mutoxan * NCI-C00464 * Neocid * Neocidol (solid) * OMS 16 * Parachlorocidum * PEB1 * Pentachlorin * RCRA waste number U061 * Santobane * Tafidex * 1,1,1-Trichloor-2,2-bis(4-chloor fenyl)-ethaan (Dutch) * 1,1,1-Trichlor-2,2-bis(4-chlor-phenyl)-aethan (German) * Trichlorobis(4-chlorophenyl)ethane * 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane * 1,1,1-Trichloro-2,2-di(4-chlorophenyl)-ethane * 1,1,1-Tricloro-2,2-bis(4-cloro-fenil)-etano (Italian) * Zerdane
RTECS Number:	KJ3325000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Toxic: danger of serious damage to health by prolonged exposure if swallowed. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Readily absorbed through skin. Target organ(s): Liver. Pancreas. Possible Carcinogen (US). Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 2
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 2
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE

In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE

In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT

162.0 - 171.0 °F 72.0 - 77.0 °C

AUTOIGNITION TEMP

N/A

FLAMMABILITY

N/A

EXTINGUISHING MEDIA

Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING

Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	TWA	1 MG/M3
USA	MSHA Standard-air	TWA	(1 MG/M3) (SKIN)
USA	OSHA.	PEL	8H TWA 1 MG/M3 (SKIN)
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	0.5 MG/M3 (0.1 MG/M3 LOQ)

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.1 MG/M3
Poland		NDSCh	0.8 MG/M3
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid	
Property	**Value**	**At Temperature or Pressure**
Molecular Weight	354.49 AMU	
pH	N/A	
BP/BP Range	260 °C	
MP/MP Range	107.0 - 109.0 °C	
Freezing Point	N/A	
Vapor Pressure	0.0000016 mmHg	20 °C
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	0.99 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 6.91	
Decomposition Temp.	N/A	
Flash Point	162.0 - 171.0 °F 72.0 - 77.0 °C	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Other Solvents: ACETONE, CHLOROBENZENE BENZENE, CYCLOHEXANONE	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Oxidizing agents Iron and iron salts.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Hydrogen chloride gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

Pancreas. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE
CNS stimulation.

CONDITIONS AGGRAVATED BY EXPOSURE
May cause nervous system disturbances.

TOXICITY DATA

Oral
Infant
150 mg/kg
LDLO
Remarks: Lungs, Thorax, or Respiration:Acute pulmonary edema.

Oral
Human
500 mg/kg
LDLO
Remarks: Lungs, Thorax, or Respiration:Other changes.
Behavioral:Convulsions or effect on seizure threshold.
Cardiac:Arrythmias (including changes it conduction).

Oral
Rat
87 mg/kg
LD50

Skin
Rat
1931 mg/kg
LD50

Intraperitoneal
Rat
9100 UG/KG
LD50

Subcutaneous
Rat
1500 MG/KG
LD50
Remarks: Behavioral:Ataxia. Behavioral:Tremor. Behavioral:Muscle weakness.

Oral
Mouse
135 mg/kg
LD50

Intraperitoneal
Mouse
32 MG/KG
LD50

Oral
Dog
150 mg/kg
LD50

Oral

Monkey
200 mg/kg
LD50

Oral
Rabbit
250 mg/kg
LD50

Skin
Rabbit
300 mg/kg
LD50
Remarks: Behavioral:Ataxia. Behavioral:Tremor. Behavioral:Muscle weakness.

Subcutaneous
Rabbit
250 MG/KG
LD50
Remarks: Behavioral:Ataxia. Behavioral:Tremor. Behavioral:Muscle weakness.

Oral
Guinea pig
150 mg/kg
LD50

Skin
Guinea pig
1000 mg/kg
LD50
Remarks: Behavioral:Ataxia. Behavioral:Tremor. Behavioral:Muscle weakness.

Subcutaneous
Guinea pig
900 MG/KG
LD50
Remarks: Behavioral:Ataxia. Behavioral:Tremor. Behavioral:Muscle weakness.

Oral
Hamster
> 5000 mg/kg
LD50

Oral
Frog
7.6 mg/kg
LD50

Parenteral
Frog
24100 UG/KG
LD50

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Oral
Dose: 1225 MG/KG
Exposure Time: 7W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Species: Mouse
Route of Application: Oral
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic Effects: Uterine tumors. Liver:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 73 MG/KG
Exposure Time: 26W
Frequency: C
Result: Lungs, Thorax, or Respiration:Tumors. Blood:Lymphomas including Hodgkin's disease. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Subcutaneous
Dose: 370 MG/KG
Exposure Time: 80W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Hamster
Route of Application: Oral
Dose: 21280 MG/KG
Exposure Time: 38W
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Endocrine:Thyroid tumors. Tumorigenic Effects: Uterine tumors

Species: Rat
Route of Application: Oral
Dose: 12096 MG/KG
Exposure Time: 3Y
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 7560 MG/KG
Exposure Time: 90W
Frequency: C
Result: Lungs, Thorax, or Respiration:Tumors. Liver:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Oral
Dose: 5600 MG/KG
Exposure Time: 80W
Frequency: I
Result: Blood:Lymphomas including Hodgkin's disease. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Rat
Route of Application: Oral
Dose: 8100 MG/KG
Exposure Time: 2Y
Frequency: C
Result: Kidney, Ureter, Bladder:Changes in tubules (including acute renal failure, acute tubular necrosis). Liver:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Mouse
Route of Application: Oral
Dose: 3150 MG/KG
Exposure Time: 15W
Frequency: C
Result: Liver:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Mouse
Route of Application: Oral
Result: Lungs, Thorax, or Respiration:Tumors. Tumorigenic Effects: Uterine tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Rat
Route of Application: Oral
Dose: 19 GM/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Rat
Route of Application: Oral
Dose: 438 MG/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors. Blood:Lymphomas including Hodgkin's disease.

Species: Rat
Route of Application: Oral
Dose: 17976 MG/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.

Species: Rat
Route of Application: Oral
Dose: 24192 MG/KG
Exposure Time: 3Y
Frequency: C
Result: Liver:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

IARC CARCINOGEN LIST

Rating: Group 2B

NTP CARCINOGEN LIST

Rating: No evidence.
Species: Mouse/rat

Route: Feed

ACGIH CARCINOGEN LIST

Rating: A3

IRIS/EPA CARCINOGEN LIST
Rating: Group B2
Species: Mouse
Route: Feed

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 250 MG/KG
Route of Application: Oral
Exposure Time: (15-19D PREG)
Result: Specific Developmental Abnormalities: Urogenital system.

Species: Mouse
Dose: 418 MG/KG
Route of Application: Subcutaneous
Exposure Time: (6-14D PREG)
Result: Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord).

Species: Mouse
Dose: 3 MG/KG
Route of Application: Unreported
Exposure Time: (10-17D PREG)
Result: Specific Developmental Abnormalities: Urogenital system.
Effects on Newborn: Delayed effects.

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 500 MG/L
Cell Type: lymphocyte
Mutation test: DNA inhibition

Species: Human
Dose: 100 MG/KG
Cell Type: fibroblast
Mutation test: Other mutation test systems

Species: Human
Dose: 40 MG/L
Cell Type: leukocyte
Mutation test: Cytogenetic analysis

Species: Human
Dose: 200 UG/L
Exposure Time: 72H
Cell Type: lymphocyte
Mutation test: Cytogenetic analysis

Species: Rat
Route: Oral
Dose: 4620 MG/KG
Exposure Time: 77D
Mutation test: Morphological transformation.

Species: Rat
Dose: 100 PMOL/L
Cell Type: liver
Mutation test: Unscheduled DNA synthesis

Species: Rat
Route: Oral
Dose: 50 UMOL/KG
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 100 MG/L
Cell Type: Other cell types
Mutation test: DNA inhibition

Species: Rat
Route: Intraperitoneal
Dose: 100 MG/KG
Mutation test: Cytogenetic analysis

Species: Rat
Dose: 10 UG/L
Cell Type: Other cell types
Mutation test: Cytogenetic analysis

Species: Rat
Route: Oral
Dose: 100 MG/KG
Mutation test: Dominant lethal test

Species: Rat
Route: Oral
Dose: 1 GM/KG
Exposure Time: 2D
Mutation test: sperm

Species: Mouse
Dose: 42600 NMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 15 UMOL/L
Cell Type: Ascites tumor
Mutation test: DNA

Species: Mouse
Route: Oral
Dose: 18 MG/KG
Mutation test: Other mutation test systems

Species: Mouse
Route: Intraperitoneal
Dose: 20 GM/KG
Mutation test: DNA inhibition

Species: Mouse
Route: Intraperitoneal
Dose: 50 PPM
Mutation test: Cytogenetic analysis

Species: Mouse

Route: Unreported
Dose: 50 MG/KG
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Oral
Dose: 300 MG/KG
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Oral
Dose: 100 MG/KG
Mutation test: Dominant lethal test

Species: Mouse
Route: Unreported
Dose: 200 MG/KG
Exposure Time: 10W
Mutation test: Dominant lethal test

Species: Mammal
Dose: 50 MG/L
Cell Type: fibroblast
Mutation test: Other mutation test systems

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 112 MG/KG
Route of Application: Oral
Exposure Time: (56D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count). Paternal Effects: Testes, epididymis, sperm duct.

Species: Rat
Dose: 100 MG/KG
Route of Application: Oral
Exposure Time: (1D MALE)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Rat
Dose: 430 MG/KG
Route of Application: Oral
Exposure Time: (1-22D PREG/21D POST)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Rat
Dose: 1890 MG/KG
Route of Application: Oral
Exposure Time: (36W PRE)
Result: Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated).

Species: Rat
Dose: 50 MG/KG
Route of Application: Oral
Exposure Time: (1D MALE)

Result: Effects on Fertility: Other measures of fertility

Species: Rat
Dose: 60 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (3D PRE)
Result: Maternal Effects: Uterus, cervix, vagina.

Species: Rat
Dose: 21 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (21D POST)
Result: Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4). Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Species: Mouse
Dose: 504 MG/KG
Route of Application: Oral
Exposure Time: (21D POST)
Result: Effects on Newborn: Behavioral.

Species: Mouse
Dose: 81 MG/KG
Route of Application: Oral
Exposure Time: (4W MALE/4W PRE-2W POST)
Result: Effects on Fertility: Other measures of fertility

Species: Mouse
Dose: 124 MG/KG
Route of Application: Oral
Exposure Time: (62D PRE)
Result: Maternal Effects: Menstrual cycle changes or disorders.

Species: Mouse
Dose: 148 MG/KG
Route of Application: Oral
Exposure Time: (66D PRE/1-8D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Mouse
Dose: 40 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (1-3D PREG)
Result: Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Species: Mouse
Dose: 40 MG/KG
Route of Application: Intraperitoneal
Exposure Time: (1D PRE)
Result: Maternal Effects: Menstrual cycle changes or disorders.

Species: Mouse
Dose: 143 MG/KG
Route of Application: Subcutaneous
Exposure Time: (21D POST)
Result: Effects on Newborn: Delayed effects.

Species: Mouse
Dose: 40 MG/KG
Route of Application: Subcutaneous
Exposure Time: (3D PRE)
Result: Maternal Effects: Menstrual cycle changes or disorders. Maternal Effects: Ovaries, fallopian tubes. Maternal Effects: Uterus, cervix, vagina.

Species: Mouse
Dose: 17500 UG/KG
Route of Application: Unreported
Exposure Time: (8-14D PREG)
Result: Effects on Newborn: Behavioral.

Species: Dog
Dose: 3540 MG/KG
Route of Application: Oral
Exposure Time: (MULTIGENERATIONS)
Result: Maternal Effects: Parturition. Effects on Newborn: Delayed effects.

Species: Rabbit
Dose: 150 MG/KG
Route of Application: Oral
Exposure Time: (7-9D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Maternal Effects: Parturition. Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 0.01 mg/l

Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 0.009 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Dannish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT
Proper Shipping Name: Toxic solids, organic, n.o.s.
UN#: 2811
Class: 6.1
Packing Group: Packing Group III

Hazard Label: Toxic substances.
PIH: Not PIH

IATA
Proper Shipping Name: Toxic solid, organic, n.o.s.
IATA UN Number: 2811
Hazard Class: 6.1
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 25-40-48/25-50/53
Risk Statements: Toxic if swallowed. Limited evidence of a carcinogenic effect. Toxic: danger of serious damage to health by prolonged exposure if swallowed. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 22-36/37-45-60-61
Safety Statements: Do not breathe dust. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Toxic: danger of serious damage to health by prolonged exposure if swallowed. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Do not breathe dust. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Readily absorbed through skin. Target organ(s): Liver. Pancreas. Possible Carcinogen (US). Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2010 Sigma-Aldrich Co. License granted to make unlimitedpaper copies for internal use only.

MATERIAL SAFETY DATA SHEET

Date Printed: 10/18/2010
Date Updated: 09/03/2009
Version 1.7

Section 1 - Product and Company Information

Product Name	BENZO(G,H,I)PERYLENE, 98%
Product Number	B9009
Brand	ALDRICH
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1-12-BENZOPERYLENE	191-24-2	Yes

Formula	C22H12
Synonyms	1,12-Benzoperylene * 1,12-Benzperylene
RTECS Number:	DI6200500

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Dangerous for the environment.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

HMIS RATING
HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING
HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious

amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Exercise appropriate precautions to minimize direct contact with skin or eyes and prevent inhalation of dust.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid inhalation. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks.
Hand: Protective gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES

Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	276.34 AMU	
pH	N/A	
BP/BP Range	500 °C	760 mmHg
MP/MP Range	278 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 6.63	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:Insoluble.	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and

toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC CARCINOGEN LIST

Rating: Group 3

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 80 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Mouse
Route: Skin
Dose: 40 UMOL/KG
Mutation test: DNA damage

Mutation test: Histidine reversion (Ames)

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: N
Indication of Danger: Dangerous for the environment.
R: 50/53

Risk Statements: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 60-61
Safety Statements: This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Dangerous for the environment.
Risk Statements: Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is subject to SARA section 313 reporting requirements.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MSDS Safety Information

TOP

FSC:	MSDS Date:	MSDS Num:
6810	03/10/1988	BHGVP

Submitter:	LIIN:	Tech Review:	Status CD:
N EN	00N010747	03/01/1989	C

Product ID:	MFN:
BENZO(B)FLUORANTHENE 50MG,CATALOG NO,48490	01

Article:	Kit Part:
N	N

Cage:

Responsible Party HO582

Name:

SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:
BELLEFONTE	PA	16823−0048

Country:

NK

Info Phone Number:

814−359−3441

Emergency Phone Number:

814−359−3441

Preparer's Name:

N/P

Proprietary Ind:

N

Review Ind: Y

Published: Y

Special Project CD: N

Contractor Summary

TOP

Cage:	Name:
54968	SIGMA−ALDRICH INC.

Address:	Box:
3050 SPRUCE STREET	14508

City:	State:	Zip:
ST. LOUIS	MO	63103

Country:	Phone:
US	314−771−5765/414−273−3850X5996

Cage:	Name:
HO582	SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:

BELLEFONTE PA 16823−0048

Country: NK **Phone:** 814−359−3441

Ingredients

TOP

Cas: 205−99−2 M CU1400000 M

Code: RTECS #: Code:

Name: **BENZO[B]FLUORANTHANE (SARA III)**

% Text: N/K FPN Environmental Wt:

Other REC Limits: N/A MFR

OSHA PEL:

A2; 9293 Code: M OSHA STEL: Code:

ACGIH TLV: NOT ESTABLISHED Code: M ACGIH STEL: N/P Code:

EPA Rpt Qty: 1 LB DOT Rpt Qty: 1 LB

Ozone Depleting Chemical:

N

Health Hazards Data

TOP

LD50 LC50 Mixture

LD50 N/A MFR

Route Of Entry Inds − Inhalation:YES Skin:NO Ingestion:YES

Carcinogenicity Inds − NTP:YES IARC:YES OSHA:NO

Health Hazards Acute And Chronic

SEE SIGN & SYMPTOMS OF OVEREXPOSURE.

Explanation Of Carcinogenicity

BENZO(B)FLUORANTHENE:NTP,MAY REASONABLY BE ANTICIPATED TO BE CARC.IARC,ANIMAL CARCINOGEN(FPN).RPTD ANIMAL (MFR).

Signs And Symptions Of Overexposure

REPORTED ANIMAL CARCINOGEN.

Medical Cond Aggravated By Exposure

N/K FPN

First Aid

EYES:FLUSH WITH PLENTY OF POTABLE WATER FOR AT LEAST 15 MINUTES,THEN OBTAIN PROMPT MEDICAL ATTENTION (FPN).SKIN:PROMPTLY WASH SKIN WITH MILD SOAP & LARGE VOLUMES OF WATER REMOVE CONTAMINATED CLOTHING. CONTACT PHYSICIAN.INHAL:IMMEDIATELY MOVE TO FRESH AIR.CONTACT PHYSICIAN.INGEST:NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON,NEVER TRY TO MAKE AN UNCONSCIOUS PERSON VOMIT.IMMED CONTACT PHYS.

Spill Release Procedures

SWEEP UP MATERIAL.AVOID GENERATING DUST.

Neutralizing Agent

N/K FPN

Waste Disposal Methods

COMPLY WITH ALL APPLICABLE FEDERAL,STATE,OR LOCAL REGULATIONS.

Handling And Storage Precautions

REFRIGERATE IN SEALED CONTAINER.AVOID GENERATING DUST.PROTECT FROM EXPOSURE TO LIGHT.

Other Precautions

REPORTED CANCER HAZARD.AVOID EYE OR SKIN CONTACT.

========== Fire and Explosion Hazard Information ==========

TOP

Flash Point Method:

N/P

Flash Point:		Flash Point Text:	N/K FPN
Autoignition Temp:		Autoignition Temp Text:	N/A
Lower Limits:	N/K FPN	Upper Limits:	N/K FPN

Extinguishing Media

CO*2,DRY CHEMICAL

Fire Fighting Procedures

WEAR SELF CONTAINED BREATHING APPARATUS WHEN FIGHTING A CHEMICAL FIRE(MFR).USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT(FPN).

Unusual Fire/Explosion Hazard

N/A MFR

========== Control Measures ========== TOP

Respiratory Protection

WEAR SELF CONTAINED BREATHING APPARATUS.NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FPN).

Ventilation

USE ONLY IN EXHAUST HOOD.

Protective Gloves

WEAR GLOVES

Eye Protection

SAFETY GLASSES WITH SIDESHIELDS(FPN)

Other Protective Equipment

N/A

Work Hygienic Practices

OBSERVE GOOD WORK HYGIENIC PRACTICES(FPN).

Supplemental Safety and Health

N/P

========== Physical/Chemical Properties ========== TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point:

B.P. Text: N/A MFR

Melt/Freeze Pt: M.P/F.P Text: 334 F;168 C

Decomp Temp: Decomp Text: N/F FPN

Vapor Pres: N/A MFR Vapor Density: N/A MFR

Volatile Org Content %: Spec Gravity: N/A MFR

VOC Pounds/Gallon:

PH: N/KFPN

VOC Grams/Liter: Viscosity: N/P

Evaporation Rate & Reference: N/A MFR

Solubility in Water: N/A MFR

Appearance and Odor: LIGHT YELLOW CRYSTALLINE SOLID.

Percent Volatiles by Volume: N/AMFR Corrosion Rate: N/K FPN

========== Reactivity Data ==========

TOP

Stability Indicator:

YES

Stability Condition To Avoid: N/A MFR

Materials To Avoid: N/A MFR

Hazardous Decomposition Products: N/A MFR

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization WILL NOT OCCUR.

:

========== Toxicological Information ==========

TOP

Toxicological Information:

N/P

========== Ecological Information ==========

TOP

Ecological:

N/P

========== MSDS Transport Information ==========

TOP

Transport Information:

N/P

========== Regulatory Information ==========

TOP

Sara Title III Information:

N/P

Federal Regulatory Information: N/P

State Regulatory Information: N/P

========== Other Information ==========

TOP

Other Information:

N/P

==========

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Material Safety Data Sheet

Catalog Number: 159069
Revision date: 24-Apr-2006

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY INFORMATION

Catalog Number: 159069

Product name: BENZO(a)PYRENE

Synonyms: 3,4-Benzpyrene; 3,4-Benzopyrene; 6,7-Benzopyrene; BAP; B(a)P
Supplier:
MP Biomedicals, LLC
29525 Fountain Parkway
Solon, OH 44139
tel: 440-337-1200

Emergency telephone number: CHEMTREC: 1-800-424-9300 (1-703-527-3887)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA Exposure Limits:
BENZO(a)PYRENE	50-32-8	90 - 100%	0.2 mg/m³ (as benzene solubles)	benzene soluble fraction: 0.2 mg/m³ TWA (includes anthracene, BaP, phenanthrene, acridine, chrysene, and pyrene)

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Combustible material, Harmful to flora, fauna, soil organisms and aquatic organisms., Toxic: danger of very serious irreversible effects if swallowed. May also have serious irreversible effects through skin contact or inhalation.

Category of Danger:
Toxic , Dangerous for the environment , Repr. cat. 2 , Muta. cat. 2, Carc. cat. 2

Principle routes of exposure: Skin
Inhalation: Harmful: possible risk of irreversible effects through inhalation.
Ingestion: Toxic: danger of very serious irreversible effects if swallowed.
Skin contact: Harmful: danger of serious damage to health by prolonged skin contact.
Eye contact: Risk of serious damage to eyes

Statements of hazard COMBUSTIBLE MATERIAL AND VAPOR.
Toxic if swallowed
Statement of Spill or Leak - ANSI Label Eliminate all ignition sources. Absorb and/or contain spill with inert materials (e.g., sand, vermiculite). Then place in appropriate container. For large spills, use water spray to disperse vapors, flush spill area. Prevent runoff from entering waterways or sewers.
Precautions - ANSI Label Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist

4. FIRST AID MEASURES

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Inhalation: Move to fresh air. Call a physician immediately.
Skin contact: Rinse immediately with plenty of water for at least 15 minutes
Ingestion: Drink 1 or 2 glasses of water. Induce vomiting, but only if victim is fully conscious. Induce vomiting if person is conscious.
Eye contact: Flush eye(s) immediately with plenty of water. Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Protection of first-aiders: No information available
Medical conditions aggravated by exposure: None known

5. FIRE FIGHTING MEASURES

Suitable extinguishing media:	Foam, Water spray
Specific hazards:	Burning produces irritant fumes.
Unusual hazards:	None known
Special protective equipment for firefighters:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods:	Water mist may be used to cool closed containers.
Flash point:	> 200 °C (Cleveland open cup ASTM D 92)
Autoignition temperature:	> 500 °C at 1013.25 hPa

NFPA rating:

NFPA Health:	2
NFPA Flammability:	0
NFPA Reactivity:	0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Use personal protective equipment.
Environmental precautions:	Prevent product from entering drains.
Methods for cleaning up:	Sweep up and shovel into suitable containers for disposal.

7. HANDLING AND STORAGE

Storage:

+4°C

Handling:	Use only in area provided with appropriate exhaust ventilation.
Safe handling advice:	Wear personal protective equipment. Remove and wash contaminated clothing before reuse.
Technical measures/storage conditions:	Keep container tightly closed in a dry and well-ventilated place.
Incompatible products:	Oxidising and spontaneously flammable products

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: Ensure adequate ventilation, especially in confined areas.
PERSONAL PROTECTIVE EQUIPMENT
Respiratory protection: Breathing apparatus only if aerosol or dust is formed.
Hand protection: Pvc or other plastic material gloves
Skin and body protection: Impervious clothing Long sleeved clothing

Eye protection: Safety glasses with side-shields
Hygiene measures: Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor	Pale yellow crystals; yellow-green fluorescence in ultraviolet light; faint aromatic odor reported, but this may be due to contaminants.
Physical state:	Powder
Formula:	C20H12
Molecular weight:	252.32
Melting point/range:	179-179.3 °C (354-355 °F)
Boiling point/range:	310-312 °C (590-594 °F) at 10 mmHg; 495 °C (923 °F) at 760 mmHg
Density:	1.351 (water = 1)
Vapor pressure:	5.6 x 10-9 mm Hg at 25 °C
Evaporation rate:	No data available
Vapor density:	No data available
Solubility (in water):	Practically not soluble
Flash point:	> 200 °C (Cleveland open cup ASTM D 92)
Autoignition temperature:	> 500 °C at 1013.25 hPa

10. STABILITY AND REACTIVITY

Stability:	Stable under recommended storage conditions.
Polymerization:	None under normal processing.
Hazardous decomposition products:	Thermal decomposition can lead to release of irritating gases and vapours such as carbon oxides.
Materials to avoid:	-

Strong oxidizers may cause fires and explosions.

Conditions to avoid:	Exposure to air or moisture over prolonged periods.

11. TOXICOLOGICAL INFORMATION

Product Information
Acute toxicity

Components	**RTECS Number:**	**Selected LD50s and LC50s**
BENZO(a)PYRENE	DJ3675000	Not Determined

Chronic toxicity:	Chronic exposure may cause nausea and vomiting, higher exposure causes unconsciousness.
Local effects:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Specific effects:	May include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache.
Primary irritation:	No data is available on the product itself.
Carcinogenic effects:	Possible carcinogen
Mutagenic effects:	Substances which should be regarded as being mutagenic to man.
Reproductive toxicity:	Experiments have shown reproductive toxicity effects on laboratory animals.

Components	**NIOSH - Health Effects**	**NIOSH - Target Organs**
BENZO(a)PYRENE		respiratory system, bladder, kidneys, skin and lung, kidney and skin cancer

12. ECOLOGICAL INFORMATION

Mobility: No data available
Bioaccumulation: No data available
Ecotoxicity effects: No data available
Aquatic toxicity: May cause long-term adverse effects in the aquatic environment.

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants	United Kingdom - The Red List:
BENZO(a)PYRENE	Not Listed	Not Listed	Not Listed

Components	Germany VCI (WGK)	World Health Organization (WHO) - Drinking Water	Ecotoxicity - Fish Species Data
BENZO(a)PYRENE	Not Listed	0.7 ug/L	Not Listed

Components	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Microtox Data	Ecotoxicity - Water Flea Data
BENZO(a)PYRENE	Not Listed	Not Listed	Not Listed

Components	EPA - ATSDR Priority List	EPA - HPV Challenge Program Chemical List	California - Priority Toxic Pollutants
BENZO(a)PYRENE	Rank (of 275): 008	indicator 2; Not sponsored	Not Listed

Components	California - Priority Toxic Pollutants	California - Priority Toxic Pollutants
BENZO(a)PYRENE	Water and organisms = 0.0044 ug/L; organisms only = 0.049 ug/L	Not Listed

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.

Contaminated packaging: Do not re-use empty containers

14. TRANSPORT INFORMATION

UN/Id No: 2811

DOT:

Proper shipping name: Toxic solid, organic, n.o.s.
IATA Hazard Label(s): Toxic
Hazard Class 6.1 **-**
Toxic substances - oral
Packing group: III

Emergency Response Guide Number (ERG): 154

Components	U.S. DOT - Appendix A Table 1 - Reportable Quantities
BENZO(a)PYRENE	RQ = 1 pound (0.454 kg); also listed as 3,4-Benzopyrene

TDG (Canada):

WHMIS hazard class: D2a very toxic materials

:

IMDG/IMO

Proper shipping name: Toxic solid, organic, n.o.s.

IMDG - Hazard Classifications Not Applicable

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants
BENZO(a)PYRENE	Not Listed	Not Listed

IMO-labels:

15. REGULATORY INFORMATION

International Inventories

Components
BENZO(a)PYRENE

Inventory - United States TSCA - Sect. 8(b)	Present
Canada DSL Inventory List -	Present
Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	200-028-5; C20H12
Inventory - Japan:	9-1736
Korean KECL:	KE-06059
Philippines PICCS:	Present

U.S. regulations:

Components	California Proposition 65 -	Massachusetts Right to Know List:	New Jersey Right to Know List:	Pennsylvania Right to Know List:
BENZO(a)PYRENE	carcinogen; initial date 7/1/87	carcinogen; extraordinarily hazardous	sn 0207	environmental hazard; special hazardous substance

Components	Florida substance List:	Rhode Island Right to Know List:	Illinois - Toxic Air Contaminants	Connecticut - Hazardous Air Pollutants
BENZO(a)PYRENE	[present]	Toxic	B2 Carcinogen, Present on Great Waters or Great Lakes list	No hazard limiting value has been established; see Polycyclic aromatic compounds

Components	SARA 313 Emission reporting/Toxic Release of Chemicals	CERCLA/SARA - Section 302 Extremely Haz	NTP:	IARC:
BENZO(a)PYRENE	Reporting Threshold = 100 pounds; (Listed under "Polycyclic aromatic compounds")	Not Listed	Suspect Carcinogen; (under Polycyclic Aromatic Hydrocarbons) Suspect Carcinogen	Supplement 7, 1987; Monograph 35, 1985 Supplement 7, 1987; Monograph 32, 1983; (Overall evaluation upgraded from 2B to 2A with supporting evidence from other data relevant to the evaluation of ca

SARA 313 Notification: The above is your notification as to the SARA 313 listing for this product(s) pursuant to Section 313 of Title III of the Superfund Ammendments and Reauthorization Act of 1986 and 40 CFR Part 372.

If you are unsure if you are subject to the reporting requirements of Section 313, or need more information, please call the EPA Emergency Planning and Community Right-To-Know Information Hotline: (800) 535-0202 or (202) 479-2499 (in Washington, DC or Alaska).

State Notification: The above information is your notice as to the Right-to-Know listings of the stated product(s). Individual states will list chemicals for a variety of reasons including, but not limited to, the compounds toxicity; carcinogenic, tumorigenic and/or reproductive hazards; and the compounds environmental impact if accidentally released.

16. OTHER INFORMATION

Prepared by: Health & Safety
Disclaimer: The information and recommendations contained herein are based upon tests believed to be reliable. However, MP Biomedicals does not guarantee the accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage maybe required. MP Biomedicals assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

!! This is an ARCHIVE Record !!

MSDS Safety Information

TOP

FSC:	MSDS Date:	MSDS Num:
6810	05/16/1985	BHYRL

Submitter:	LIIN:	Tech Review:	Status CD:
N EN	00N010656	07/15/1989	C

Product ID:	MFN:
BENZO(A)ANTHRACENE 0.1G,48563	01

Article:	Kit Part:
N	N

Cage:

Responsible Party HO582

Name:

SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:
BELLEFONTE	PA	16823−0048

Country:

NK

Info Phone Number:

814−359−3441

Emergency Phone Number:

814−359−3441

Preparer's Name:

N/P

Proprietary Ind:

N

Review Ind: Y

Published: Y

Special Project CD: N

Contractor Summary

TOP

Cage:	Name:
54968	SIGMA−ALDRICH INC.

Address:

3050 SPRUCE STREET

Box:

14508

City:	State:	Zip:
ST. LOUIS	MO	63103

Country:	Phone:
US	314−771−5765/414−273−3850X5996

Cage:	Name:
HO582	SUPELCO,INC.

Address:

SUPELCO PARK

City: **State:** **Zip:**

BELLEFONTE PA 16823−0048

Country: **Phone:**

NK 814−359−3441

Ingredients

TOP

Cas: 56−55−3 M CV9275000 M

Code: RTECS #: Code:

Name: **BENZ A ANTHRACENE (SARA III)**

% Text: N/K Environmental Wt:

Other REC Limits: N/K (FP N/ORNL)

OSHA PEL:

NOT ESTABLISHED Code: M OSHA STEL: Code:

ACGIH TLV: A2 ; 9394 Code: M ACGIH STEL: N/P Code:

EPA Rpt Qty: 10 LBS DOT Rpt Qty: 10 LBS

Ozone Depleting Chemical:

N

Health Hazards Data

TOP

LD50 LC50 Mixture

N/A

Route Of Entry Inds − Inhalation:NO Skin:NO Ingestion:NO

Carcinogenicity Inds − NTP:YES IARC:YES OSHA:NO

Health Hazards Acute And Chronic

SEE SIGNS AND SYMPTOMS OF OVEREXPOSURE.

Explanation Of Carcinogenicity

SUSPECTED HUM CARCIN/KNOWN ANIM CARCIN (NTP 1985).INADEQ EVID FOR CARC IN HUM,SUFF EVID FOR CARC IN ANIMALS (IARC 1987).

Signs And Symptions Of Overexposure

EYES/SKIN/INGESTION/INHALATION:N/K (FP N/ORNL).

Medical Cond Aggravated By Exposure

N/K (FP N/ORNL)

First Aid

EYES:FLUSH WITH WATER FOR AT LEAST 15 MINUTES.SKIN:FLUSH WITH LARGE VOLUMES OF WATER.REMOVE CONTAMINATED CLOTHING.INGESTION:CONTACT PHYSICIAN.INHALATION:IMMEDIAATELY MOVE TO FRESH AIR.GIVE OXYGEN IF B REATHING IS LABORED.IF BREATHING STOPS,GIVE ARTIFICIAL RESPIRATION.CONTACT PHYSICIAN.

Spill Release Procedures

SWEEP UP MATERIAL.VENTILATE AREA.AVOID GENERATING DUST.

Neutralizing Agent

N/K (FP N/ORNL)

Waste Disposal Methods

DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL,STATE AND LOCAL REGULATIONS (FP N).

Handling And Storage Precautions

STORE IN SEALED CONTAINER IN COOL,DRY LOCATION.KEEP AWAY FROM OXIDIZERS.AVOID GENERATING DUST.

Other Precautions

REPORTED CANCER HAZARD.AVOID EYE OR SKIN CONTACT.

========== Fire and Explosion Hazard Information ==========

TOP

Flash Point Method:

N/P

Flash Point:		Flash Point Text:	N/K (FP N/ORNL)
Autoignition Temp:		Autoignition Temp Text:	N/A
Lower Limits:	N/K (FP N)	Upper Limits:	N/K (FP N)

Extinguishing Media

CO*2,FOAM,DRY CHEMICAL.

Fire Fighting Procedures

USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).

Unusual Fire/Explosion Hazard

N/A

========== Control Measures ========== TOP

Respiratory Protection

NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).

Ventilation

LOCAL AND GENERAL VENTILATION NECESSARY TO KEEP AIR CONCENTRATION BELOW LEVEL OF CONCERN (FP N/ORNL).

Protective Gloves

RUBBER

Eye Protection

CHEMICAL WORKERS GOGGLES (FP N).

Other Protective Equipment

N/A

Work Hygienic Practices

N/K (FP N/ORNL)

Supplemental Safety and Health

ROUTES OF ENTRY:INHALATION/SKIN/INGESTION (FP N).

========== Physical/Chemical Properties ========== TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point:		B.P. Text:	438C,820F
Melt/Freeze Pt:		M.P/F.P Text:	157C,315F
Decomp Temp:		Decomp Text:	N/K (FP N)
Vapor Pres:	N/A	Vapor Density:	N/A
Volatile Org Content %:		Spec Gravity:	N/A
VOC Pounds/Gallon:			
		PH:	N/K
VOC Grams/Liter:		Viscosity:	N/P
Evaporation Rate & Reference:	N/A		
Solubility in Water:	N/A		
Appearance and Odor:	PALE YELLOW CRYSTAL.		
Percent Volatiles by Volume:	N/A	Corrosion Rate:	N/K

========== Reactivity Data ========== TOP

Stability Indicator:

YES

Stability Condition To Avoid: N/A

Materials To Avoid: OXIDIZING AGENTS.

Hazardous Decomposition Products: N/A

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization N/A

:

========== Toxicological Information ========== TOP

Toxicological Information:

N/P

========== Ecological Information ========== TOP

Ecological:

N/P

========== MSDS Transport Information ========== TOP

Transport Information:

N/P

========== Regulatory Information ==========

TOP

Sara Title III Information:

N/P

Federal Regulatory Information: N/P

State Regulatory Information: N/P

========== Other Information ==========

TOP

Other Information:

N/P

==========

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Material Safety Data Sheet

Version 3.5
Revision Date 04/05/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Benzene
Product Number	:	12540
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Carcinogen, Target Organ Effect, Irritant

Target Organs

Blood, Eyes, Female reproductive system., Bone marrowBlood, Eyes, Female reproductive system., Bone marrow

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Oral (Category 5)
Skin irritation (Category 2)
Eye irritation (Category 2A)
Germ cell mutagenicity (Category 1B)
Carcinogenicity (Category 1A)
Aspiration hazard (Category 1)
Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H303	May be harmful if swallowed.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H340	May cause genetic defects.
H350	May cause cancer.
H401	Toxic to aquatic life.

Precautionary statement(s)

P201	Obtain special instructions before use.
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	3
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C_6H_6
Molecular Weight : 78.11 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Benzene			
71-43-2	200-753-7	601-020-00-8	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Specific hazards arising from the chemical
Flash back possible over considerable distance. Container explosion may occur under fire conditions.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Benzene	71-43-2	TWA	0.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies. Danger of cutaneous absorption			
		STEL	2.5 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Leukemia Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed human carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies. Danger of cutaneous absorption			
		TWA	10 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.40-1969			
		CEIL	25 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.40-1969			
		Peak	50 ppm	USA. Occupational Exposure Limits (OSHA) - Table Z2

	Z37.40-1969			
	See 1910.1028. See Table Z-2 for the limits applicable in the operations or sectors excluded in 1910.1028 The final benzene standard in 1910.1028 applies to all occupational exposures to benzene except some subsegments of industry where exposures are consistently under the action level (i.e., distribution and sale of fuels, sealed containers and pipelines, coke production, oil and gas drilling and production, natural gas processing, and the percentage exclusion for liquid mixtures); for the excepted subsegments, the benzene limits in Table Z-2 apply.			
		TWA	0.1 ppm	USA. NIOSH Recommended Exposure Limits
	Potential Occupational Carcinogen See Appendix A			
		ST	1 ppm	USA. NIOSH Recommended Exposure Limits
	Potential Occupational Carcinogen See Appendix A			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 5.5 °C (41.9 °F)
Boiling point	80 °C (176 °F)
Flash point	-11.0 °C (12.2 °F) - closed cup
Ignition temperature	562 °C (1,044 °F)
Autoignition temperature	562.0 °C (1,043.6 °F)
Lower explosion limit	1.3 %(V)

Upper explosion limit	8 %(V)
Vapour pressure	221.3 hPa (166.0 mmHg) at 37.7 °C (99.9 °F) 99.5 hPa (74.6 mmHg) at 20.0 °C (68.0 °F)
Density	0.874 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
acids, Bases, Halogens, Strong oxidizing agents, Metallic salts

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 2,990 mg/kg

Inhalation LC50
LC50 Inhalation - rat - female - 4 h - 44,700 mg/m3

Dermal LD50
LD50 Dermal - rabbit - 8,263 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Skin irritation

Serious eye damage/eye irritation
Eyes - rabbit - Eye irritation

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.
In vivo tests showed mutagenic effects

Genotoxicity in vitro - Human - lymphocyte
Sister chromatid exchange

Genotoxicity in vitro - mouse - lymphocyte
Mutation in mammalian somatic cells.

Genotoxicity in vivo - mouse - Inhalation
Sister chromatid exchange

Carcinogenicity

Carcinogenicity - Human - male - Inhalation
Tumorigenic:Carcinogenic by RTECS criteria. Leukaemia Blood:Thrombocytopenia.

Carcinogenicity - rat - Oral
Tumorigenic:Carcinogenic by RTECS criteria. Endocrine:Tumors. Leukaemia

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Human carcinogen.

IARC: 1 - Group 1: Carcinogenic to humans (Benzene)

NTP: Known to be human carcinogen (Benzene)

Reproductive toxicity
Reproductive toxicity - mouse - Intraperitoneal
Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea). Effects on Embryo or Fetus: Fetal death.

Teratogenicity

Developmental Toxicity - rat - Inhalation
Effects on Embryo or Fetus: Extra embryonic structures (e.g., placenta, umbilical cord). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Developmental Toxicity - mouse - Inhalation
Effects on Embryo or Fetus: Cytological changes (including somatic cell genetic material). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed. Aspiration hazard if swallowed - can enter lungs and cause damage.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Nausea, Dizziness, Headache, narcosis, Inhalation of high concentrations of benzene may have an initial stimulatory effect on the central nervous system characterized by exhilaration, nervous excitation and/or giddiness, depression, drowsiness, or fatigue. The victim may experience tightness in the chest, breathlessness, and loss of consciousness. Tremors, convulsions, and death due to respiratory paralysis or circulatory collapse can occur in a few minutes to several hours following severe exposures. Aspiration of small amounts of liquid immediately causes pulmonary edema and hemorrhage of pulmonary tissue. Direct skin contact may cause erythema. Repeated or prolonged skin contact may result in drying, scaling dermatitis, or development of secondary skin infections. The chief target organ is the hematopoietic system. Bleeding from the nose, gums, or mucous membranes and the development of purpuric spots, pancytopenia, leukopenia, thrombocytopenia, aplastic anemia, and leukemia may occur as the condition progresses. The bone marrow may appear normal, aplastic or hyperplastic, and may not correlate with peripheral blood-forming tissues. The onset of effects of prolonged benzene exposure may be delayed for many months or years after the actual exposure has ceased., Blood disorders

Synergistic effects
no data available

Additional Information
RTECS: CY1400000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 5.90 mg/l - 96 h
	LC50 - Pimephales promelas (fathead minnow) - 15.00 - 32.00 mg/l - 96 h
	LC50 - Lepomis macrochirus (Bluegill) - 230.00 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - 10.2 mg/l - 7 d
	LOEC - Pimephales promelas (fathead minnow) - 17.2 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 22.00 mg/l - 48 h
	EC50 - Daphnia magna (Water flea) - 9.20 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata (green algae) - 29.00 mg/l - 72 h

Persistence and degradability

Biodegradability	Result: - Readily biodegradable.

Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d Bioconcentration factor (BCF): 10

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene
Reportable Quantity (RQ): 10 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1114 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: BENZENE
Marine pollutant: No

IATA
UN number: 1114 Class: 3 Packing group: II
Proper shipping name: Benzene

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Carcinogen, Target Organ Effect, Irritant

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Benzene	71-43-2	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Benzene	71-43-2	2009-02-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Benzene	71-43-2	2009-02-01

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 01/02/2009
Print Date 10/29/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Barium

Product Number : 11720
Brand : Fluka

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Ba
Molecular Weight : 137.34 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Barium			
7440-39-3	231-149-1	-	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Water Reactive, Irritant

HMIS Classification
Health Hazard: 2
Flammability: 3
Physical hazards: 3

NFPA Rating
Health Hazard: 2
Fire: 0
Reactivity Hazard: 1
Special hazard.: W

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	not applicable
Ignition temperature	no data available

Suitable extinguishing media
Carbon dioxide (CO_2) Dry powder

Extinguishing media which shall not be used for safety reasons
Water

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods for cleaning up
Pick up and arrange disposal without creating dust. Do not flush with water. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage
Keep container tightly closed in a dry and well-ventilated place. Store in cool place.
Never allow product to get in contact with water during storage.

Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	grey

Safety data

pH	no data available
Melting point	725 °C (1,337 °F)
Boiling point	1,640 °C (2,984 °F) at 1,013 hPa (760 mmHg)
Flash point	not applicable
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	3.600 g/cm3 at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks. Exposure to moisture.

Materials to avoid
Oxidizing agents, Water, acids, Oxygen, Chlorinated solvents, Carbon dioxide (CO_2), Halogens, Halogenated hydrocarbon, Alcohols, Sulphur compounds, Hydrogen sulfide gas

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Barium oxide

Hazardous reactions
Reacts violently with water.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

no data available

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

Stomach/intestinal disorders, Nausea, Vomiting, Drowsiness, Dizziness, Gastrointestinal disturbance, Weakness, Tremors, Seizures.

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

Additional Information
RTECS: CQ8370000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

Toxicity to fish	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 500 mg/l - 96 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - > 500 mg/l - 96 h

Further information on ecology

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1400 Class: 4.3 Packing group: II EMS-No: F-G, S-O
Proper shipping name: BARIUM
Marine pollutant: No

IATA
UN-Number: 1400 Class: 4.3 Packing group: II
Proper shipping name: Barium

15. REGULATORY INFORMATION

OSHA Hazards
Water Reactive, Irritant

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Barium	7440-39-3	1991-07-01

SARA 311/312 Hazards
Reactivity Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	1991-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	1991-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Barium	7440-39-3	1991-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

FLINN SCIENTIFIC INC.

"Your Safer Source for Science Supplies"

Material Safety Data Sheet (MSDS)

MSDS #: 80.10
Revision Date: November 25, 2002

Section 1 — Chemical Product and Company Identification

Arsenic

Flinn Scientific, Inc. P.O. Box 219 Batavia, IL 60510 (800) 452-1261

CHEMTREC Emergency Phone Number: (800) 424-9300

Section 2 — Composition, Information on Ingredients

Arsenic

CAS#: 7440-38-2

Section 3 — Hazards Identification

Silver-grey crystalline, brittle solid, or grey powder.
Darkens upon exposure to moist air.
Moderately toxic; known Carcinogen. Avoid all body contact. May be fatal if ingested, inhaled or absorbed through the skin. Practice strict hygiene.

FLINN AT-A-GLANCE
Health-2
Flammability-1
Reactivity-1
Exposure-3
Storage-3

0 is low hazard, 3 is high hazard

Section 4 — First Aid Measures

Call a physician, seek medical attention for further treatment, observation and support after first aid.
Inhalation: Remove to fresh air at once. If breathing has stopped give artificial respiration immediately.
Eye: Immediately flush with fresh water for 15 minutes.
External: Wash continuously with fresh water for 15 minutes.
Internal: Give no more than 1-2 cups of water for dilution. Do not induce vomiting. Call a physician or poison control at once.

Section 5 — Fire Fighting Measures

Non-flammable, non-combustible solid.
Releases toxic fumes at high temperature.
Flammable in the form of dust when exposed to heat or flame or by chemical reactions.
Fire Fighting Instructions: Use triclass, dry chemical fire extinguisher. Firefighters should wear PPE and SCBA with full facepiece operated in positive pressure mode.

NFPA CODE
None Established

Section 6 — Accidental Release Measures

Restrict unprotected personnel from area. Remove all ignition sources and water . Sweep up, place in sealed bag or container and dispose. Ventilate area and wash spill site after material pickup is complete. See Sections 8 and 13 for further information.

Section 7 — Handling and Storage

Flinn Suggested Chemical Storage Pattern: Inorganic #10. Store with sulfur and phosphorus.
Store in a Flinn Chem-Saf Bag or in a Flinn Chem-Saf Cube. Store in a poison cabinet. Use and dispense in a hood.

Section 8 — Exposure Controls , Personal Protection

Avoid contact with eyes, skin and clothing. Wear chemical splash goggles, chemical-resistant gloves and chemical-resistant apron. Use ventilation to keep airborne concentrations below exposure limits. Always wear a NIOSH-approved respirator with proper cartridges or a positive pressure, air-supplied respirator when handling this material in emergency situations (spill or fire).
Exposure guidelines: TWA 0.01 mg/m3 (OSHA)

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Section 9 — Physical and Chemical Properties

Silver-grey crystalline, brittle solid
Solubility: Insoluble in water. Soluble in HNO3
Formula: As
Formula Weight: 74.92

Specific Gravity: 5.72.
Melting Point: 814 C.
Sublimes at 613 C.

Section 10 — Stability and Reactivity

When heated or on contact with acid or acid fumes, it emits highly toxic fumes; can react vigorously on contact with oxidizing materials. Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.
Shelf life: Indefinite.

Section 11 — Toxicological Information

Acute effects: Moderately toxic
Chronic effects: OSHA regulated carcinogen
Target organs: Skin, lungs

ORL-RAT LD50: 763 mg/kg
IHL-RAT LC50: N.A.
SKN-RBT LD50: N.A.

N.A. = Not available, not all health aspects of this substance have been fully investigated.

Section 12 — Ecological Information

Data not yet available.

Section 13 — Disposal Considerations

Please consult with state and local regulations.
Flinn Suggested Disposal Method #27d is one option.

Section 14 — Transport Information

Shipping Name: Arsenic
Hazard Class: 6.1, Poison
UN Number: UN1558

N/A = Not applicable

Section 15 — Regulatory Information

TSCA-listed, EINECS-listed (231-148-6), RCRA code D004.

Section 16 — Other Information

Consult your copy of the Flinn Scientific Catalog/Reference Manual for additional information about laboratory chemicals. This Material Safety Data Sheet (MSDS) is for guidance and is based upon information and tests believed to be reliable. Flinn Scientific Inc. makes no guarantee of the accuracy or completeness of the data and shall not be liable for any damages relating thereto. The data is offered solely for your consideration, investigation, and verification. Flinn Scientific Inc. assumes no legal responsibility for use or reliance upon this data.

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Material Safety Data Sheet

Version 4.1
Revision Date 10/19/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Anthracene
Product Number	:	31581
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

Target Organs

Lungs, Kidney, Bladder, Blood

Other hazards which do not result in classification
Photosensitizer., Lachrymator.

GHS Classification
Skin irritation (Category 2)
Eye irritation (Category 2A)
Specific target organ toxicity - single exposure (Category 3)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if

present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	0
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula	:	$C_{14}H_{10}$
Molecular Weight	:	178.23 g/mol

Component		Concentration
Anthracene		
CAS-No.	120-12-7	-
EC-No.	204-371-1	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Anthracene	120-12-7	TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	beige

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 210 - 215 °C (410 - 419 °F) - lit.

Boiling point	340 °C (644 °F) - lit.
Flash point	121.0 °C (249.8 °F) - closed cup
Ignition temperature	540 °C (1,004 °F)
Autoignition temperature	540.0 °C (1,004.0 °F)
Lower explosion limit	0.6 %(V)
Vapour pressure	1.3 hPa (1.0 mmHg) at 145.0 °C (293.0 °F)
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 4.45
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents, Hypochlorites

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Intraperitoneal - mouse - 430 mg/kg

Skin corrosion/irritation
Skin - mouse - Mild skin irritation

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Anthracene)
	2B - Group 2B: Possibly carcinogenic to humans (Anthracene)
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Anthracene)
	2B - Group 2B: Possibly carcinogenic to humans (Anthracene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Known to be human carcinogen (Anthracene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Possible tumor promoter., Headache, Nausea, Weakness

Synergistic effects
no data available

Additional Information
RTECS: CA9350000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 0.001 mg/l - 96.0 h
Toxicity to daphnia	EC50 - Daphnia magna (Water flea) - 0.10 mg/l - 48 h

and other aquatic invertebrates.

Persistence and degradability

Bioaccumulative potential
Indication of bioaccumulation.

Bioaccumulation	Pimephales promelas (fathead minnow) - 42 d Bioconcentration factor (BCF): 649

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Anthracene)
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Anthracene)
Marine pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Anthracene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Anthracene	120-12-7	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Anthracene	120-12-7	1990-01-01

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS Safety Information

TOP

FSC:	MSDS Date:	MSDS Num:
6810	03/10/1988	BHVJC

Submitter:	LIIN:	Tech Review:	Status CD:
N EN	00N010773	07/15/1989	C

Product ID:	MFN:
ALPHA−BHC,50 MG,R431020	01

Article:	Kit Part:
N	N

Cage:

Responsible Party HO582

Name:

SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:
BELLEFONTE	PA	16823−0048

Country:

NK

Info Phone Number:

814−359−3441

Emergency Phone Number:

814−359−3441

Preparer's Name:

N/P

Proprietary Ind:

N

Review Ind: Y

Published: Y

Special Project CD: N

Contractor Summary

TOP

Cage:	Name:
54968	SIGMA−ALDRICH INC.

Address:	Box:
3050 SPRUCE STREET	14508

City:	State:	Zip:
ST. LOUIS	MO	63103

Country:	Phone:
US	314−771−5765/414−273−3850X5996

Cage:	Name:
HO582	SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:

BELLEFONTE PA 16823−0048

Country: NK

Phone: 814−359−3441

Ingredients

TOP

Cas: 319−84−6 M GV3500000 M

Code: RTECS #: Code:

Name: **ALPHA−BHC (SARA III)**

% Text: N/K

Environmental Wt:

Other REC Limits: N/K (FP N/ORNL)

OSHA PEL:

NOT ESTABLISHED

Code: M OSHA STEL: Code:

ACGIH TLV: NOT ESTABLISHED

Code: M ACGIH STEL: N/P Code:

EPA Rpt Qty: 10 LBS

DOT Rpt Qty: 10 LBS

Ozone Depleting Chemical:

N

Health Hazards Data

TOP

LD50 LC50 Mixture

LD50 RAT ORAL 500 MG/KG

Route Of Entry Inds − Inhalation:YES Skin:N/P Ingestion:YES

Carcinogenicity Inds − NTP:NO IARC:YES OSHA:NO

Health Hazards Acute And Chronic

HARMFUL IF INHALED OR SWALLOWED.

Explanation Of Carcinogenicity

ALPHA−HEXACHLOROCYCLOHEXANE (BENZENE HEXACHLORIDE):SUFFICIENT EVIDENCE FOR CARCINOGENICITY IN ANIMALS (IARC 1987).

Signs And Symptions Of Overexposure

EYES/SKIN:N/K (FP N/ORNL).INGESTION:HARMFUL IF SWALLOWED.INHALATION:HARMFUL IF INHALED.

Medical Cond Aggravated By Exposure

N/K (FP N/ORNL)

First Aid

EYES:FLUSH WITH WATER FOR AT LEAST 15 MINUTES.SKIN:FLUSH WITH LARGE VOLUMES OF WATER.INGESTION:NEVER GIVE ANYTHING BY MOUTH TO UNCONSCIOUS PERSON.NEVER TRY TO MAKE UNCONSCIOUS PERSON VOMIT.INHALATION: IMMEDIATELY MOVE TO FRESH AIR.GIVE OXYGEN IF BREATHING IS LABORED.CONTACT PHYSICIAN.

Spill Release Procedures

TAKE UP WITH ABSORBENT MATERIAL.AVOID GENERATING DUST.

Neutralizing Agent

N/K (FP N/ORNL)

Waste Disposal Methods

DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL,STATE AND LOCAL REGULATIONS (FP N).

Handling And Storage Precautions

STORE IN SEALED CONTAINER IN COOL,DRY LOCATION.AVOID GENERATING DUST.

Other Precautions

REPORTED CANCER HAZARD.AVOID EYE OR SKIN CONTACT.

========== Fire and Explosion Hazard Information ==========

TOP

Flash Point Method: N/P

Flash Point:

Flash Point Text: N/K (FP N/ORNL)

Autoignition Temp:

Autoignition Temp Text: N/A

Lower Limits: N/K (FP N)

Upper Limits: N/K (FP N)

Extinguishing Media

WATER,CO*2,DRY CHEMICAL.

Fire Fighting Procedures

USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).

Unusual Fire/Explosion Hazard

TOXIC CHLORIDE VAPORS ARE FORMED WHEN THIS MATERIAL IS HEATED TO DECOMPOSITION.

========== Control Measures ========== TOP

Respiratory Protection

NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).

Ventilation

LOCAL AND GENERAL VENTILATION NECESSARY TO KEEP AIR CONCENTRATION BELOW LEVEL OF CONCERN (FP N/ORNL).

Protective Gloves

RECOMMENDED

Eye Protection

CHEMICAL WORKERS GOGGLES (FP N).

Other Protective Equipment

N/A

Work Hygienic Practices

N/K (FP N/ORNL)

Supplemental Safety and Health

ROUTES OF ENTRY:INHALATION/INGESTION (FP N).

========== Physical/Chemical Properties ========== TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point: B.P. Text: N/A

Melt/Freeze Pt:

M.P/F.P Text: 159C,318F

Decomp Temp:

Decomp Text: N/K (FP N)

Vapor Pres: N/A

Vapor Density: N/A

Volatile Org Content %:

Spec Gravity: N/A

VOC Pounds/Gallon:

PH: N/K

VOC Grams/Liter:

Viscosity: N/P

Evaporation Rate & Reference: N/A

Solubility in Water: N/A

Appearance and Odor: WHITE SOLID.

Percent Volatiles by Volume: N/A

Corrosion Rate: N/K

========== Reactivity Data ==========

TOP

Stability Indicator:

YES

Stability Condition To Avoid: N/A

Materials To Avoid: N/A

Hazardous Decomposition Products: CHLORIDES

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization N/A

:

========== Toxicological Information ==========

TOP

Toxicological Information:

N/P

========== Ecological Information ==========

TOP

Ecological:

N/P

========== MSDS Transport Information ==========

TOP

Transport Information:

N/P

========== Regulatory Information ========== TOP

Sara Title III Information:

N/P

Federal Regulatory Information: N/P

State Regulatory Information: N/P

========== Other Information ========== TOP

Other Information:

N/P

==========

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Material Safety Data Sheet

Version 4.0
Revision Date 03/14/2010
Print Date 10/23/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Aldrin
Product Number	:	36666
Brand	:	Fluka
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Highly toxic by ingestion, Highly toxic by skin absorption, Carcinogen

Target Organs

Central nervous system, Reproductive system., Liver, Kidney

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H300 + H310	Fatal if swallowed or in contact with skin.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P264	Wash hands thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/protective clothing.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P310	Immediately call a POISON CENTER or doctor/physician.

HMIS Classification

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	4
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May cause skin irritation. May be fatal if absorbed through skin.
Eyes	May cause eye irritation.
Ingestion	May be fatal if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{12}H_8Cl_6$
Molecular Weight : 364.91 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Aldrin			
309-00-2	206-215-8	602-048-00-3	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Aldrin	309-00-2	TWA	0.25 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
Remarks	Skin notation				
		TWA	0.25 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Skin designation				
		TWA	0.05 mg/m3	2006-11-17	USA. ACGIH Threshold Limit Values (TLV)
	Skin contact does contribute to exposure. Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is lilkely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	colourless

Safety data

pH	no data available
Melting point	96.0 - 98.0 °C (204.8 - 208.4 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1.60 g/cm3 at 20.00 °C (68.00 °F)
Water solubility	insoluble
Partition coefficient:	log Pow: 6.50

n-octanol/water

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 39.0 mg/kg

LD50 Dermal - rabbit - 15.0 mg/kg
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Olfaction:Other changes. Behavioral:Convulsions or effect on seizure threshold. Behavioral:Excitement.

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Aldrin)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be fatal if swallowed.
Skin	May cause skin irritation. May be fatal if absorbed through skin.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Nausea, Vomiting, Headache, Tremors, Incoordination., Dizziness, Cyanosis, Seizures., Unconsciousness

Additional Information
RTECS: IO2100000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.01 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 0.03 mg/l - 48 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d Bioconcentration factor (BCF): 3,700

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s.
Reportable Quantity (RQ): 1 lbs
Marine pollutant: Severe marine pollutant
Poison Inhalation Hazard: No

IMDG
UN-Number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S.
Marine pollutant: Severe marine pollutant

IATA
UN-Number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solid, organic, n.o.s.

15. REGULATORY INFORMATION

OSHA Hazards
Highly toxic by ingestion, Highly toxic by skin absorption, Carcinogen

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
Aldrin	309-00-2

SARA 302 Components

	CAS-No.	Revision Date
Aldrin	309-00-2	1987-01-01

SARA 313 Components

	CAS-No.	Revision Date
Aldrin	309-00-2	1987-01-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Aldrin	309-00-2	1987-01-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Aldrin	309-00-2	1987-01-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Aldrin	309-00-2	1987-01-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Aldrin	309-00-2	1990-06-15

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MATERIAL SAFETY DATA SHEET

Section 1: Manufacturer or Supplier

Identity: "Acetone" Precision Cleaning Solvent
Date: October 12, 1999
Manufacturer: DGR Industrial Products
4435 North First Street, Suite #184
Livermore, CA 94550

Emergency Phone: (408) 221-7122

Section 2: Hazardous Ingredients/Identity Information
Hazardous Components:
2-Propanone (Dimethylketone) CAS #: 67-64-1 (99.99%)

Section 3: Physical Data

Appearance	Clear Liquid
Odor	Sweet
Physical State at STP:	Liquid
Boiling Point:	190 F
Spec. Grav. (H20 = 1.00):	.94
Vapor Density (Air = 1)	> 1
Evap Rate (Butyl Acetate = 1)	< 1
Vapor Pressure (mm Hg):	33 @ 77 F
Solubility in Water:	Complete, miscible

Section 4: Fire & Explosion Hazard Data

Class:	Class IB Flammable Liquid
Flash Point:	53 F (Tag Closed Cup)
Autoignition Temp:	n/a

Explosive Limits in Air (% by Volume at 200 F):
Upper (UEL) = 12.7%
Lower (LEL) = 2.0%

Extinguishing Media to be Used: Dry chemical or "Alcohol" Foam

Special Fire Fighting Procedures: Wear self-contained breathing apparatus approved by NIOSH and full protective clothing. Cool containers with water spray.

Unusual Fire and Explosion Hazards: None identified

Section 5: Health Hazard Data

Primary Route of Entry	Inhalation
IDLH Level:	12,000 ppm
NIOSH/OSHA:	400 ppm

Effects of Overexposure:

* Inhalation:	Irritation of upper respiratory tract.
* Ingestion:	May cause throat irritation, dizziness, drowsiness
* Skin Contact:	May cause skin irritation.
* Eye Contact	May cause eye irritation.

Health Effects or Risks from Exposure: No information available.

Emergency and First Aid:

Remove to fresh air. If not breathing apply artificial respiration and oxygen. Remove contaminated clothing and wash skin with water. Flush eyes with copious amounts of water for at least 15 minutes. If swallowed, induce vomiting as directed by physician. Consult physician in all cases.

Section 6: Reactivity Data

Stability: Stable

Incompatibility (Materials to Avoid): Strong oxidizing agents, strong acids, chlorine, ethylene oxide, isocyanates.

Hazardous Decomposition: None

Hazardous Polymerization: Will not occur

Section 7: Spill or Leak Procedures

Steps to be taken if spill occurs:

Evacuate area and keep personnel from fumes. Cut off any source of ignition and ventilate the spill area. Contain spill with absorbent material. Transfer absorbent and other contaminated materials to a covered metal container for disposal. Consult with Federal, State and local regulatory agencies to determine acceptable clean-up levels. Comply with Federal, State and local regulations on reporting releases.

Waste Disposal Method:

Dispose of all waste in accordance with Federal, State and local agencies.

Section 8: Special Protection Information

Respiratory Protection: Use a NIOSH approved half-mask respirator with canisters or cartridges approved for organic vapors.

Protective Gloves: Rubber

Eye Protection: Safety Goggles or Face Shield

Other Protective Equipment: Rubber apron or more comprehensive impervious clothing where gross contact is probable. Wear rubber boots when handling large volumes.

Section 9: Special Precautions

* Storage & Handling: Store in well-ventilated area away from acids or oxidizing agents.

* This material is for industrial use and should only be used under the supervision of a technically qualified individual.

Material Safety Data Sheet

Version 4.0
Revision Date 07/24/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Acenaphthylene
Product Number	:	416703
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{12}H_8$
Molecular Weight : 152.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Acenaphthylene			
208-96-8	205-917-1	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Do not let product enter drains.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	78 - 82 °C (172 - 180 °F) - lit.
Boiling point	280 °C (536 °F) - lit.
Flash point	122.0 °C (251.6 °F) - closed cup
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	0.899 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - mouse - 1,760 mg/kg
Remarks: Autonomic Nervous System:Other (direct) parasympathomimetic. Respiratory disorder Blood: Hemorrhage.

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: AB1254000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Acenaphthylene)
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
Acenaphthylene	208-96-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Acenaphthylene	208-96-8	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Acenaphthylene	208-96-8	

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/02/2007
Date Updated: 02/01/2006
Version 1.5

Section 1 - Product and Company Information

Product Name	ACENAPHTHENE
Product Number	A9394
Brand	SIGMA
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
ACENAPHTHENE	83-32-9	No

Formula	C12H10
Synonyms	Acenaphthylene, 1,2-dihydro- * 1,2-Dihydroacenaphthylene * peri-Ethylenenaphthalene * 1,8-Ethylenenaphthalene * Naphthyleneethylene
RTECS Number:	AB1000000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Irritant. Dangerous for the environment.
Irritating to eyes, respiratory system and skin. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

HMIS RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give

artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT
257 °F 125 °C Method: closed cup

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.
Hand: Compatible chemical-resistant gloves.

Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	154.21 AMU	
pH	N/A	
BP/BP Range	279 °C	760 mmHg
MP/MP Range	92 °C	
Freezing Point	N/A	
Vapor Pressure	10 mmHg	131 °C
Vapor Density	5.32 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 3.387 - 4.1 86	
Decomposition Temp.	N/A	
Flash Point	257 °F 125 °C	Method: closed cup
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solvent: 0.1 g/ml dioxane Clear	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material is irritating to

mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Intraperitoneal
Rat
600 MG/KG
LD50

Section 12 - Ecological Information

No data available.

ACUTE ECOTOXICITY TESTS
Test Type: LC50 Fish
Species: Cyprinodon variegatus (Sheepshead minnow)
Time: 96 h
Value: 2.2 - 3.1 mg/l

Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 1.7 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 0.67 mg/l

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 0.6 - 1.730 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 1.275 - 3.450 mg/l

Test Type: EC50 Algae
Species: Selenastrum capricornutum resp.
Time: 96 h
Value: 0.520 - 0.530 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous

substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: Xi-N
Indication of Danger: Irritant. Dangerous for the environment.
R: 36/37/38-50/53
Risk Statements: Irritating to eyes, respiratory system and skin. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 26-36/37/39-60-61
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Irritant. Dangerous for the environment.
Risk Statements: Irritating to eyes, respiratory system and skin. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The

information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2007 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/22/2006
Date Updated: 01/29/2006
Version 1.9

Section 1 - Product and Company Information

Product Name	BENZO(K)FLUORANTHENE, 50MG, NEAT
Product Number	48492
Brand	SUPELCO
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
BENZO(K)FLUORANTHENE	207-08-9	Yes

Formula	C20H12
Synonyms	8,9-Benzofluoranthene * 11,12-Benzofluoranthene * 11,12-Benzo(k)fluoranthene * 2,3,1',8'-Binaphthylene * Dibenzo(b,jk)fluorene
RTECS Number:	DF6350000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic.
Irritating to eyes, respiratory system and skin. May cause cancer.
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Probable Carcinogen (US). Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.
Store at 2-8°C

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are

appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid Color: Yellow Form: Fine crystals

Property	Value	At Temperature or Pressure
Molecular Weight	252.32 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	215 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: May be harmful if inhaled. Material is irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

SIGNS AND SYMPTOMS OF EXPOSURE

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Implant
Dose: 5 MG/KG
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 2820 MG/KG
Exposure Time: 47W
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 72 MG/KG
Exposure Time: 9W
Frequency: I
Result: Tumorigenic:Tumors at site or application. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

IARC CARCINOGEN LIST

Rating: Group 2B

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 120 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 45-50/53
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 53-45-60-61
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic.
Risk Statements: Irritating to eyes, respiratory system and skin. May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Probable Carcinogen (US). Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is subject to SARA section 313 reporting requirements.

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65

California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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Material Safety Data Sheet

Version 4.1
Revision Date 03/01/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Lead
Product Number	:	391352
Brand	:	Aldrich
Product Use	:	For laboratory research purposes.
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Manufacturer	:	Sigma-Aldrich Corporation 3050 Spruce St. St. Louis, Missouri 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Target Organ Effect, Harmful by ingestion., Teratogen

Target Organs

Nerves., Blood, Kidney, Female reproductive system., Male reproductive system.

GHS Classification
Acute toxicity, Oral (Category 4)
Carcinogenicity (Category 2)
Reproductive toxicity (Category 2)
Specific target organ toxicity - repeated exposure (Category 2)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H351	Suspected of causing cancer.
H361	Suspected of damaging fertility or the unborn child.
H373	May cause damage to organs through prolonged or repeated exposure.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard: 1
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating

Health hazard: 1
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin Harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Pb
Molecular Weight : 207.2 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Lead			
7439-92-1	231-100-4	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Lead oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Remarks	See 1910.1025			
Lead	7439-92-1	TWA	0.05 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.			
		TWA	0.05 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Central Nervous System impairment Hematologic effects Peripheral Nervous System impairment Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.			
		TWA	0.05 mg/m3	USA. NIOSH Recommended Exposure Limits
	See Appendix C			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 327.4 °C (621.3 °F) - lit.
Boiling point	1,740 °C (3,164 °F) - lit.
Flash point	not applicable
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong acids

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Lead oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

Genotoxicity in vivo - rat - Inhalation
Cytogenetic analysis

Carcinogenicity

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Lead)
NTP:	Reasonably anticipated to be a human carcinogen (Lead)
	Reasonably anticipated to be a human carcinogenThe reference note has been added by TD based on the background information of the NTP. (Lead)
OSHA:	1910.1025 (Lead)

Reproductive toxicity
Reproductive toxicity - rat - Inhalation
Effects on Newborn: Biochemical and metabolic.
Reproductive toxicity - rat - Oral
Effects on Newborn: Behavioral.
Reproductive toxicity - mouse - Oral
Effects on Fertility: Female fertility index (e.g., # females pregnant per # sperm positive females; # females pregnant per # females mated). Effects on Fertility: Pre-implantation mortality (e.g., reduction in number of implants per female; total number of implants per corpora lutea).

Teratogenicity

Developmental Toxicity - rat - Inhalation
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow).

Developmental Toxicity - rat - Oral
Specific Developmental Abnormalities: Blood and lymphatic system (including spleen and marrow). Effects on Newborn: Growth statistics (e.g., reduced weight gain).

Developmental Toxicity - rat - Oral
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Developmental Toxicity - mouse - Oral
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Suspected human reproductive toxicant

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
May cause damage to organs through prolonged or repeated exposure.

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
anemia

Synergistic effects
no data available

Additional Information
RTECS: OF7525000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 1.19 mg/l - 96.0 h
	LC50 - Micropterus dolomieui - 2.2 mg/l - 96.0 h
	mortality NOEC - Salvelinus fontinalis - 1.7 mg/l - 10.0 d
Toxicity to daphnia and other aquatic invertebrates.	mortality LOEC - Daphnia - 0.17 mg/l - 24 h
	mortality NOEC - Daphnia - 0.099 mg/l - 24 h
Toxicity to algae	mortality EC50 - Skeletonema costatum - 7.94 mg/l - 10 d

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Oncorhynchus kisutch - 2 Weeks Bioconcentration factor (BCF): 12

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Lead)
Reportable Quantity (RQ): 10 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Lead)
Marine pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Lead)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Target Organ Effect, Harmful by ingestion., Teratogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Lead	7439-92-1	1994-04-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	1994-04-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	1994-04-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Lead	7439-92-1	1994-04-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Lead	7439-92-1	1989-07-10

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Lead	7439-92-1	1989-07-10

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.3
Revision Date 11/22/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Indeno[1,2,3-*cd*]pyrene
Product Number	:	48499
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

GHS Classification
Carcinogenicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H351 Suspected of causing cancer.

Precautionary statement(s)
P281 Use personal protective equipment as required.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{22}H_{12}$ $C_{22}H_{12}$
Molecular Weight : 276.33 g/mol

Component		Concentration
Indeno[1,2,3-cd]pyrene		
CAS-No.	193-39-5	-
EC-No.	205-893-2	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	163.6 °C (326.5 °F)
Boiling point	536.0 °C (996.8 °F)
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available

Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Indeno[1,2,3-cd]pyrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Indeno[1,2,3-cd]pyrene)
	Reasonably anticipated to be a human carcinogen (Indeno[1,2,3-cd]pyrene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Indeno[1,2,3-cd]pyrene	193-39-5	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Indeno[1,2,3-cd]pyrene	193-39-5	2007-09-28

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 06/12/2009
Print Date 10/23/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Hexachlorobenzene

Product Number : 52100
Brand : Fluka

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C_6Cl_6
Molecular Weight : 284.78 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Hexachlorobenzene			
118-74-1	204-273-9	602-065-00-6	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

Target Organs

Liver

HMIS Classification
Health Hazard: 3
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating
Health Hazard: 3
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties
Flash point no data available

Ignition temperature no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Storage
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control	Update	Basis

			parameters		
Hexachlorobenzene	118-74-1	TWA	0.002 mg/m3	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Central Nervous System impairment Porphyrin effects Skin damage Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is lilkely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure. Danger of cutaneous absorption				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	white

Safety data

pH	no data available
Melting point	227 - 229 °C (441 - 444 °F) 227 - 229 °C (441 - 444 °F)
Boiling point	323 - 326 °C (613 - 619 °F)
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 10,000 mg/kg

LD50 Oral - mouse - 4,000 mg/kg

LD50 Oral - cat - 1,700 mg/kg

LD50 Oral - rabbit - 2,600 mg/kg

LD50 Oral - guinea pig - > 3,000 mg/kg

LD50 Oral - Quail - > 6,400 mg/kg

LD50 Oral - Mammal - > 5,000 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Change in motor activity (specific assay).

LC50 Inhalation - rat - 3,600 mg/m3

LC50 Inhalation - mouse - 4,000 mg/m3

LC50 Inhalation - cat - 1,600 mg/m3

LC50 Inhalation - rabbit - 1,800 mg/m3

Irritation and corrosion

no data available

Sensitisation

Skin sensitization

Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Chronic exposure

This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Hexachlorobenzene)
NTP:	Reasonably anticipated to be a human carcinogen (Hexachlorobenzene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.
Target Organs	Liver,

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Bioaccumulation	Pimephales promelas (fathead minnow) - 32 d Bioconcentration factor (BCF): 22,000

Ecotoxicity effects

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 7.6 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - > 0.0048 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - > 0.005 mg/l - 48 h

Further information on ecology

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2729 Class: 6.1 Packing group: III
Proper shipping name: Hexachlorobenzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2729 Class: 6.1 Packing group: III EMS-No: F-A, S-A
Proper shipping name: HEXACHLOROBENZENE
Marine pollutant: No

IATA
UN-Number: 2729 Class: 6.1 Packing group: III
Proper shipping name: Hexachlorobenzene

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Hexachlorobenzene	118-74-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Hexachlorobenzene	118-74-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Hexachlorobenzene	118-74-1	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause cancer. Hexachlorobenzene	118-74-1	2007-09-28

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm. Hexachlorobenzene	118-74-1	2007-09-28

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 12/26/2008
Print Date 10/27/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Heptachlor

Product Number : PS78
Brand : Supelco

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1,4,5,6,7,8,8-Heptachloro-3a,4,7,7a-tetrahydro-4,7-methanoindene

Formula : $C_{10}H_5Cl_7$
Molecular Weight : 373.32 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Heptachlor			
76-44-8	200-962-3	602-046-00-2	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Highly toxic by ingestion, Highly toxic by skin absorption

HMIS Classification
Health Hazard: 3
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating
Health Hazard: 3
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May cause skin irritation. May be fatal if absorbed through skin.

Eyes May cause eye irritation.
Ingestion May be fatal if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties
Flash point no data available

Ignition temperature no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis

Heptachlor	76-44-8	TWA	0.05 mg/m3	1994-09-01	US. American Conference of Governmental and Industrial Hygienists Threshold Limit Values for Chemical Substances in the Work Environment; Annual Reports for the Year 2004:Committees on Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)
Remarks	Skin contact does contribute to exposure. Confirmed animal carcinogen with unknown relevance to humans. 1994-1995 Adoption Substance identified by other sources as a suspected or confirmed human carcinogen. Refers to Appendix A -- Carcinogens.				
		TWA	0.5 mg/m3	1989-03-01	US. Department of Labor - Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1000 Z-1-A
	Skin contact does contribute to exposure.				
		TWA	0.5 mg/m3	1993-06-30	US. Department of Labor - Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL) 29 CFR 1910.1000 Air Contaminants.
	Skin contact does contribute to exposure.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	no data available
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 40.0 mg/kg

LD50 Dermal - rat - 119.0 mg/kg

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	Group 2B - The agent (mixture) is possibly carcinogenic to humans. (Heptachlor)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May cause skin irritation. May be fatal if absorbed through skin.
Eyes	May cause eye irritation.
Ingestion	May be fatal if swallowed.

Additional Information
RTECS: PC0700000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Bioaccumulation	Pimephales promelas (fathead minnow) - 276 d Bioconcentration factor (BCF): 23,814

Ecotoxicity effects

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.007 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	LC50 - Daphnia magna (Water flea) - 0.078 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solids, organic, n.o.s. (Heptachlor)
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2811 Class: 6.1 Packing group: II EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Heptachlor)
Marine pollutant: No

IATA
UN-Number: 2811 Class: 6.1 Packing group: II
Proper shipping name: Toxic solid, organic n.o.s. (Heptachlor)

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Highly toxic by ingestion, Highly toxic by skin absorption

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
Heptachlor	76-44-8

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	1987-01-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	1987-01-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	1987-01-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Heptachlor	76-44-8	1987-01-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause cancer. Heptachlor	76-44-8	1992-11-09

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm. Heptachlor	76-44-8	1992-11-09

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 10/25/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fluorene
Product Number	:	128333
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
No known OSHA hazards

Not a dangerous substance according to GHS.

HMIS Classification

Health hazard:	1
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula	:	$C_{13}H_{10}$
Molecular Weight	:	166.22 g/mol

No ingredients are hazardous according to HCS criteria.

4. FIRST AID MEASURES

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

5. FIREFIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Avoid breathing vapors, mist or gas.

Environmental precautions
Do not let product enter drains.

Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
General industrial hygiene practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	white

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 111 - 114 °C (232 - 237 °F) - lit.
Boiling point	298 °C (568 °F) - lit.
Flash point	151.0 °C (303.8 °F) - closed cup
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50

no data available

Other information on acute toxicity
LD50 Intraperitoneal - mouse - > 2.0 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: LL5670000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Fish - 0.82 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Remarks: no data available
Toxicity to algae	EC50 - Algae - 3.4 mg/l - 96 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 24 h Bioconcentration factor (BCF): 512

Mobility in soil
Adsorbs on soil.

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s.
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Fluorene)
Marine pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Fluorene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
No known OSHA hazards

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Fluorene	86-73-7	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Fluorene	86-73-7	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Fluorene	86-73-7	2007-03-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.2
Revision Date 05/19/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Fluoranthene
Product Number	:	423947
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion., Carcinogen

GHS Classification
Acute toxicity, Oral (Category 4)
Acute toxicity, Dermal (Category 5)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H313	May be harmful in contact with skin.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P273	Avoid release to the environment.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	1
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	1
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Benzo[*j*,*k*]fluorene

Formula : $C_{16}H_{10}$

Molecular Weight : 202.25 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Fluoranthene			
206-44-0	205-912-4	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 105 - 110 °C (221 - 230 °F) - lit.
Boiling point	384 °C (723 °F) - lit.
Flash point	198.0 °C (388.4 °F) - closed cup
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available

Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 2,000 mg/kg

Inhalation LC50
no data available

Dermal LD50
LD50 Dermal - rabbit - 3,180 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Fluoranthene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be human carcinogens. (Fluoranthene)
	Reasonably anticipated to be a human carcinogen (Fluoranthene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: LL4025000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.0077 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 560 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - > 0.005 - < 0.01 mg/l - 3 d
	Immobilization EC50 - Daphnia magna (Water flea) - 0.78 mg/l - 20 h
	NOEC - Daphnia magna (Water flea) - 0.085 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Fluoranthene)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Harmful by ingestion., Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Fluoranthene	206-44-0	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Fluoranthene	206-44-0	1990-01-01

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 3.2
Revision Date 04/06/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Ethylbenzene
Product Number	:	03079
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Carcinogen, Irritant

Target Organs

Central nervous system, Blood

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Inhalation (Category 4)
Acute toxicity, Oral (Category 5)
Serious eye damage (Category 1)
Acute aquatic toxicity (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H303	May be harmful if swallowed.
H318	Causes serious eye damage.
H332	Harmful if inhaled.
H401	Toxic to aquatic life.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P280	Wear protective gloves/ eye protection/ face protection.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard: 2
Chronic Health Hazard: *
Flammability: 3
Physical hazards: 0

NFPA Rating
Health hazard: 3
Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C_8H_{10}
Molecular Weight : 106.17 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Ethylbenzene			
100-41-4	202-849-4	601-023-00-4	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

hygroscopic

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Ethylbenzene	100-41-4	TWA	100 ppm	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.			
		STEL	125 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Central Nervous System impairment Upper Respiratory Tract irritation Eye irritation Adopted values or notations enclosed are those for which changes are proposed in the NIC See Notice of Intended Changes (NIC) Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.			
		TWA	100 ppm 435 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	125 ppm 545 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	100 ppm 435 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.			
		TWA	100 ppm 435 mg/m3	USA. NIOSH Recommended Exposure Limits
		ST	125 ppm	USA. NIOSH Recommended Exposure Limits

			545 mg/m3	

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -95 °C (-139 °F) - lit.
Boiling point	136 °C (277 °F) - lit.
Flash point	15.0 °C (59.0 °F) - closed cup
Ignition temperature	432 °C (810 °F)
Autoignition temperature	432.0 °C (809.6 °F)
Lower explosion limit	1 %(V)
Upper explosion limit	6.7 %(V)
Vapour pressure	25.3 hPa (19.0 mmHg) at 37.7 °C (99.9 °F) 13.3 hPa (10.0 mmHg) at 20.0 °C (68.0 °F)
Density	0.867 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 2.92
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
Dermal LD50
LD50 Dermal - rabbit - 15,433 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
Eyes - rabbit - Risk of serious damage to eyes.

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Ethylbenzene)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Central nervous system depression, Nausea, Headache, Vomiting, Ataxia., Tremors

Synergistic effects
no data available

Additional Information
RTECS: DA0700000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Cyprinodon variegatus (sheepshead minnow) - 88.00 mg/l - 96 h
	LC50 - Lepomis macrochirus (Bluegill) - 80.00 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 88 mg/l - 96 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 4.2 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 2.90 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1175 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: ETHYLBENZENE
Marine pollutant: No

IATA
UN number: 1175 Class: 3 Packing group: II
Proper shipping name: Ethylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Carcinogen, Irritant

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Ethylbenzene	100-41-4	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Ethylbenzene	100-41-4	2007-09-28

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 08/23/2008
Print Date 10/29/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Endrin

Product Number : 36672
Brand : Riedel

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C12H8Cl6O
Molecular Weight : 380.91 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Endrin			
72-20-8	200-775-7	602-051-00-X	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Highly toxic by ingestion, Highly toxic by skin absorption

Target Organs

Central nervous system

HMIS Classification

Health Hazard: 4
Flammability: 0
Physical hazards: 0

NFPA Rating

Health Hazard: 4
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May cause skin irritation. May be fatal if absorbed through skin.
Eyes May cause eye irritation.

Ingestion May be fatal if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	no data available
Ignition temperature	no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Endrin	72-20-8	TWA	0.1 mg/m3	1996-05-18	US. American Conference

					of Governmental and Industrial Hygienists Threshold Limit Values for Chemical Substances in the Work Environment; Annual Reports for the Year 2004:Committees on Threshold Limit Values (TLVs) and Biological Exposure Indices (BEIs)
Remarks	Skin contact does contribute to exposure. The agent (mixture , or exposure circumstance) is not classifiable as to its carcinogenicity to humans . Refers to Appendix A -- Carcinogens. 1996 Adoption				
		TWA	0.1 mg/m3	1989-03-01	US. Department of Labor - Occupational Safety and Health Administration (OSHA) 29 CFR 1910.1000 Z-1-A
	Skin contact does contribute to exposure.				
		TWA	0.1 mg/m3	1993-06-30	US. Department of Labor - Occupational Safety and Health Administration (OSHA) Permissible Exposure Limits (PEL) 29 CFR 1910.1000 Air Contaminants.
	Skin contact does contribute to exposure.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid
Colour	colourless

Safety data

pH	no data available
Melting point	no data available
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Water solubility	insoluble
Partition coefficient: n-octanol/water	log Pow: 5.20

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Thermal decomposition
226.0 °C (438.8 °F)

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 3.0 mg/kg

LD50 Dermal - rabbit - 60.0 mg/kg

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	Group 3 - Not classifiable as to carcinogenicity to humans (Endrin)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May cause skin irritation. May be fatal if absorbed through skin.
Eyes	May cause eye irritation.
Ingestion	May be fatal if swallowed.
Target Organs	Central nervous system,

Additional Information
RTECS: IO1575000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Bioaccumulation	Pimephales promelas (fathead minnow) - 56 d Bioconcentration factor (BCF): 13,000

Ecotoxicity effects

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - < 0.001 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia pulex (Water flea) - 0.02 mg/l - 48 h
	Immobilization EC50 - Daphnia magna (Water flea) - 0.0042 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solids, organic, n.o.s. (Endrin)
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2811 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: TOXIC SOLID, ORGANIC, N.O.S. (Endrin)
Marine pollutant: No

IATA

UN-Number: 2811 Class: 6.1 Packing group: I
Proper shipping name: Toxic solid, organic n.o.s. (Endrin)

15. REGULATORY INFORMATION

OSHA Hazards
Highly toxic by ingestion, Highly toxic by skin absorption

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
Endrin	72-20-8

SARA 302 Components

	CAS-No.	Revision Date
Endrin	72-20-8	1989-12-01

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Endrin	72-20-8	1989-12-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Endrin	72-20-8	1989-12-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Endrin	72-20-8	1989-12-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm. Endrin	72-20-8	1998-05-15

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS Safety Information

TOP

FSC:	MSDS Date:	MSDS Num:
6810	03/10/1988	BHYRF

Submitter:	LIIN:	Tech Review:	Status CD:
N EN	00N010650	07/15/1989	C

Product ID:	MFN:
ENDOSULFAN SULFATE 0.1 G,48580	01

Article:	Kit Part:
N	N

Cage:

Responsible Party HO582

Name:

SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:
BELLEFONTE	PA	16823−0048

Country:

NK

Info Phone Number:

814−359−3441

Emergency Phone Number:

814−359−3441

Preparer's Name:

N/P

Proprietary Ind:

N

Review Ind: Y

Published: Y

Special Project CD: N

Contractor Summary

TOP

Cage:	Name:
54968	SIGMA−ALDRICH INC.

Address:	Box:
3050 SPRUCE STREET	14508

City:	State:	Zip:
ST. LOUIS	MO	63103

Country:	Phone:
US	314−771−5765/414−273−3850X5996

Cage:	Name:
HO582	SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:

BELLEFONTE PA 16823−0048

Country: NK **Phone:** 814−359−3441

Ingredients

TOP

Cas: 1031−07−8 M RB9150000 M

Code: RTECS #: Code:

Name: **ENDOSULFAN SULFATE (SARA III)**

% Text: N/K Environmental Wt:

Other REC Limits: N/K (FP N/ORNL)

OSHA PEL:

NOT ESTABLISHED Code: M OSHA STEL: Code:

ACGIH TLV: NOT ESTABLISHED Code: M ACGIH STEL: N/P Code:

EPA Rpt Qty: 1 LB DOT Rpt Qty: 1 LB

Ozone Depleting Chemical:

N

Health Hazards Data

TOP

LD50 LC50 Mixture

N/A

Route Of Entry Inds − Inhalation:YES Skin:NO Ingestion:YES

Carcinogenicity Inds − NTP:NO IARC:NO OSHA:NO

Health Hazards Acute And Chronic

HARMFUL IF INHALED OR SWALLOWED.

Explanation Of Carcinogenicity

REPORTED ANIMAL CARCINOGEN (MFR).

Signs And Symptions Of Overexposure

EYES/SKIN:N/K (FP N/ORNL).INGESTION/INHALATION:HARMFUL.

Medical Cond Aggravated By Exposure

N/K (FP N/ORNL)

First Aid

EYES:FLUSH W/ H*2O FOR AT LEAST 15 MIN.SKIN:FLUSH W/ LARGE VOLUMES OF WATER.INGESTION:CALL MD IMMEDIATELY (FP N).INHALATION:IMMEDIATELY MOVE TO FRESH AIR.GIVE OXYGEN IF BREATHING IS LABORED.CONTACT MD .

Spill Release Procedures

TAKE UP WITH ABSORBENT MATERIAL.AVOID GENERATING DUST.

Neutralizing Agent

N/K (FP N/ORNL)

Waste Disposal Methods

DISPOSAL MUST BE IN ACCORDANCE WITH FEDERAL,STATE AND LOCAL REGULATIONS (FP N).

Handling And Storage Precautions

STORE IN SEALED CONTAINER IN COOL,DRY LOCATION.AVOID GENERATING DUST.

Other Precautions

AVOID EYE OR SKIN CONTACT.REPORTED CANCER HAZARD (MFR).

========== Fire and Explosion Hazard Information ==========

TOP

Flash Point Method:

N/P

Flash Point:		Flash Point Text:	N/K (FP N/ORNL)
Autoignition Temp:		Autoignition Temp Text:	N/A
Lower Limits:	N/K (FP N)	Upper Limits:	N/K (FP N)

Extinguishing Media

WATER,CO*2,DRY CHEMICAL.

Fire Fighting Procedures

USE NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).

Unusual Fire/Explosion Hazard

TOXIC VAPORS OF CHLORIDES AND SO*X ARE FORMED WHEN THIS MATERIAL IS HEATED TO DECOMPOSITION.

========== Control Measures ========== TOP

Respiratory Protection

NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN (FP N).

Ventilation

LOCAL AND GENERAL VENTILATION NECESSARY TO KEEP AIR CONCENTRATION BELOW LEVEL OF CONCERN (FP N/ORNL).

Protective Gloves

RECOMMENDED

Eye Protection

CHEMICAL WORKERS GOGGLES (FP N).

Other Protective Equipment

N/A

Work Hygienic Practices

N/K (FP N/ORNL)

Supplemental Safety and Health

ROUTES OF ENTRY:INHALATION/SKIN/INGESTION (FP N).

========== Physical/Chemical Properties ========== TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point: B.P. Text: N/A

Melt/Freeze Pt: M.P/F.P Text: N/A

Decomp Temp:

Decomp Text: N/K (FP N)

Vapor Pres: N/A

Vapor Density: N/A

Volatile Org Content %:

Spec Gravity: N/A

VOC Pounds/Gallon:

PH: N/K

VOC Grams/Liter:

Viscosity: N/P

Evaporation Rate & Reference: N/A

Solubility in Water: N/A

Appearance and Odor: N/K (FP N/ORNL)

Percent Volatiles by Volume: N/A

Corrosion Rate: N/K

========== Reactivity Data ==========

TOP

Stability Indicator:

YES

Stability Condition To Avoid: N/A

Materials To Avoid: N/A

Hazardous Decomposition Products: CHLORIDES AND SO*X.

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization N/A

:

========== Toxicological Information ==========

TOP

Toxicological Information:

N/P

========== Ecological Information ==========

TOP

Ecological:

N/P

========== MSDS Transport Information ==========

TOP

Transport Information:

N/P

========== Regulatory Information ========== TOP

Sara Title III Information:

N/P

Federal Regulatory Information: N/P

State Regulatory Information: N/P

========== Other Information ========== TOP

Other Information:

N/P

==========

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Chem Service Inc.
Material Safety Data Sheet

Date: Tuesday, March 22, 2005
Last Revised Date: 4/24/03

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: F203
Description: b-Endosulfan
Other Name(s): 1,4,5,6,7,7-Hexachloro-5-norborene-2,3-dimethanol cyclic sulfite beta/beta-Endosulfan

Supplied by CHEM SERVICE, Inc. PO BOX 599, WEST CHESTER, PA 19381 (610)-692-3026
EMERGENCY PHONE: 1-610-692-3026

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS No.: 33213-65-9
Description: b-Endosulfan
EINECS No.: Not Available
Hazard Symbols: Not Available

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory.All chemicals should be considered hazardous - Avoid direct physical contact!
May be harmful if absorbed through the skin. May be harmful if inhaled. May be harmful if swallowed. Can cause nervous system injury. Exposure can cause liver damage. Exposure can cause kidney damage. Based on the toxicity of compounds of similar structure this material is probably highly hazardous.

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.
In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. Remove and wash contaminated clothing. If patient is exhibiting signs of shock - Keep warm and quiet. Contact Poison Control Center immediately if necessary. Do not administer liquids or induce vomiting to an unconscious or convulsing person. If patient is vomiting-watch closely to make sure airway does not become obstructed by vomit. Get medical attention if necessary. ANTIDOTE: A short acting barbituate for central nervouse system symptoms; Diazepam for convulsions; If ingested induce emesis administer Magnesium Sulfateand observe.

SECTION 5 - FIRE AND EXPLOSION DATA

Flash Point: Not Available
Extinguishing Media: Carbon dioxide, dry chemical powder or spray.

Upper Explosion Limit: Not Available
Lower Explosion Limit: Not Available
Autoignition Temperature: Not Available
NFPA Hazard Rating: Not Available

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills or leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Sweep up and place in an appropriate container. Hold for disposal.

Wash contaminated surfaces to remove any residues. Remove contaminated clothing and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling:
This chemical should be handled only in a hood. Eye shields should be worn.
Use appropriate OSHA/MSHA approved safety equipment.
Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation
Wash thoroughly after handling.

Storage:
Store in a cool dry place. Store only with compatible chemicals. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION
OSHA PEL (TWA): Not Available
ACGIH TLV (TWA): Not Available
ACGIH TLV (STEL): Not Available

Personal Protective Equipment
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Color: White
Phase: Crystalline solid
Melting Point: 213.3 C
Boiling Point: Not Available
Specific Gravity: Not Available
Vapor Density: 1.745 mm@2
Vapor Preasure: Not Available
Solubility in Water: Insoluble (immiscible)
Odor: Not Available
Evaporation Rate (Butyl acetate=1): Not Available
Molecular Weight: 406.91
Molecular Formula: $C_9H_6Cl_6O_3S$

SECTION 10 - STABILITY AND REACTIVITY

Incompatible with strong bases. Reacts with water and most reactive hydrogen compounds. Readily absorbed and retained on clothing and/or shoes. Incompatible with Copper and Mercury or alkaline pesticides. Decomposes under alkaline conditions.

SECTION 11 - TOXICOLOGY INFORMATION

RTECS: Not Available
Oral Rat or Mouse LD50: 240mg/kg
Dermal Rat or Mouse LD50: Not Available
Rat or Mouse LC50 : Not Available

Carcinogenicity
OSHA: No
IARC: No
NTP: No
ACGIH: No
NIOSH: No
Other: No

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL: Burn in a chemicals incinerator equipped with an afterburner and scrubber.

SECTION 14 - TRANSPORTATION INFORMATION

Not regulated as a hazardous material.

SECTION 15 - REGULATORY INFORMATION

European Labeling in Accordance with EC Directives
Hazard Symbols: Not Available

Risk Phrases: Not Available

Safety Phrase: Not Available

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

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Chem Service Inc.
Material Safety Data Sheet

Date: Monday, March 21, 2005
Last Revised Date: 4/24/03

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: F202
Description: a-Endosulfan
Other Name(s): 1,4,5,6,7,7-Hexachloro-5-norborene-2,3-dimethanol cyclic sulfite alpha

Supplied by CHEM SERVICE, Inc. PO BOX 599, WEST CHESTER, PA 19381 (610)-692-3026
EMERGENCY PHONE: 1-610-692-3026

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS No.: 959-98-8
Description: a-Endosulfan
EINECS No.: Not Available
Hazard Symbols: Not Available

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory.All chemicals should be considered hazardous - Avoid direct physical contact!
May be fatal if absorbed through the skin! May be fatal if inhaled! May be fatal if swallowed! Exposure can cause liver damage. Exposure can cause kidney damage. Can cause nervous system injury. Based on the toxicity of compounds of similar structure this material is probably highly hazardous.

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.
In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. Remove and wash contaminated clothing. If patient is exhibiting signs of shock - Keep warm and quiet. Contact Poison Control Center immediately if necessary. Do not administer liquids or induce vomiting to an unconscious or convulsing person. If patient is vomiting-watch closely to make sure airway does not become obstructed by vomit. Get medical attention if necessary. ANTIDOTE: A short acting barbituate for central nervouse system symptoms; Diazepam for convulsions; If ingested induce emesis administer Magnesium Sulfateand observe.

SECTION 5 - FIRE AND EXPLOSION DATA

Flash Point: Not Available
Extinguishing Media: Carbon dioxide, dry chemical powder or spray.
Upper Explosion Limit: Not Available

Lower Explosion Limit: Not Available
Autoignition Temperature: Not Available
NFPA Hazard Rating: Not Available

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills or leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Sweep up and place in an appropriate container. Hold for disposal.

Wash contaminated surfaces to remove any residues. Remove contaminated clothing and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling:
This chemical should be handled only in a hood. Eye shields should be worn.
Use appropriate OSHA/MSHA approved safety equipment.
Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation
Wash thoroughly after handling.

Storage:
Store in a cool dry place. Store only with compatible chemicals. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION
OSHA PEL (TWA): Not Available
ACGIH TLV (TWA): 0.1 mg/m3 skin
ACGIH TLV (STEL): Not Available

Personal Protective Equipment
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Color: White
Phase: Crystalline solid
Melting Point: 108-110 C
Boiling Point: Not Available
Specific Gravity: Not Available
Vapor Density: 1.745 mm@2
Vapor Preasure: Not Available
Solubility in Water: Insoluble (immiscible)
Odor: Not Available
Evaporation Rate (Butyl acetate=1): Not Available
Molecular Weight: 406.93
Molecular Formula: C9 H6 Cl6 O3 S

SECTION 10 - STABILITY AND REACTIVITY

Incompatible with strong bases. Reacts with water and most reactive hydrogen compounds. Readily absorbed and retained on clothing and/or shoes.

SECTION 11 - TOXICOLOGY INFORMATION

RTECS: Not Available
Oral Rat or Mouse LD50: 76mg/kg
Dermal Rat or Mouse LD50: Not Available
Rat or Mouse LC50 : Not Available

Carcinogenicity
OSHA: No
IARC: No
NTP: No
ACGIH: No
NIOSH: No
Other: No

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL: Burn in a chemicals incinerator equipped with an afterburner and scrubber.

SECTION 14 - TRANSPORTATION INFORMATION

UN Number: UN2811
Class: 6.1
Packing Group: III
Proper Shipping Name: TOXIC SOLID, ORGANIC, NOS*

SECTION 15 - REGULATORY INFORMATION

European Labeling in Accordance with EC Directives
Hazard Symbols: Not Available

Risk Phrases: Not Available

Safety Phrase: Not Available

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

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Material Safety Data Sheet

Catalog Number: 157672
Revision date: 24-Apr-2006

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY INFORMATION

Catalog Number: 157672

Product name: DIELDRIN

Synonyms: Alvit, Dieldrex
Supplier:
MP Biomedicals, LLC
29525 Fountain Parkway
Solon, OH 44139
tel: 440-337-1200

Emergency telephone number: CHEMTREC: 1-800-424-9300 (1-703-527-3887)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA Exposure Limits:
DIELDRIN	60-57-1	90 - 100%	0.25 mg/m³ TWA	0.25 mg/m³ TWA

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Harmful to flora, fauna, soil organisms and aquatic organisms., Very toxic: danger of very serious irreversible effects in contact with skin. May also have serious irreversible effects through inhalation or ingestion.

Category of Danger:
Very Toxic , Dangerous for the environment , Carc. cat. 3

Principle routes of exposure: Skin
Inhalation: Harmful: possible risk of irreversible effects through inhalation.
Ingestion: Harmful: danger of serious damage to health if ingested.
Skin contact: Very Toxic: danger of serious damage to health by prolonged skin contact.
Eye contact: Risk of serious damage to eyes

Statements of hazard Very toxic in contact with skin
Statement of Spill or Leak - ANSI Label Eliminate all ignition sources. Absorb and/or contain spill with inert materials (e.g., sand, vermiculite). Then place in appropriate container. For large spills, use water spray to disperse vapors, flush spill area. Prevent runoff from entering waterways or sewers.
Statement of First Aid (Insert POISON with Skull & Crossbones)
Call a physician immediately. If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Precautions - ANSI Label Do not taste or swallow. Wash thoroughly after handling. Avoid contact with skin, eyes and clothing Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist

4. FIRST AID MEASURES

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Inhalation: Move to fresh air. Call a physician immediately.
Skin contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician Remove and wash contaminated clothing before re-use
Ingestion: Call a physician immediately. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Drink 1 or 2 glasses of water. Induce vomiting if person is conscious.
Eye contact: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Protection of first-aiders: No information available
Medical conditions aggravated by exposure: None known

5. FIRE FIGHTING MEASURES

Suitable extinguishing media:	Use dry chemical, CO2, water spray or "alcohol" foam
Specific hazards:	Burning produces irritant fumes.
Unusual hazards:	None known
Special protective equipment for firefighters:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods:	Water mist may be used to cool closed containers.
Flash point:	Not determined
Autoignition temperature:	Not determined

NFPA rating:

NFPA Health:	2
NFPA Flammability:	1
NFPA Reactivity:	0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Use personal protective equipment.
Environmental precautions:	Prevent product from entering drains.
Methods for cleaning up:	Sweep up and shovel into suitable containers for disposal.

7. HANDLING AND STORAGE

Storage:

ROOM TEMPERATURE

Handling:	Use only in area provided with appropriate exhaust ventilation.
Safe handling advice:	Wear personal protective equipment. Remove and wash contaminated clothing before reuse.
Technical measures/storage conditions:	Keep containers tightly closed in a cool, well-ventilated place. Keep container tightly closed in a dry and well-ventilated place.
Incompatible products:	Oxidising and spontaneously flammable products

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: Ensure adequate ventilation, especially in confined areas.
PERSONAL PROTECTIVE EQUIPMENT
Respiratory protection: Breathing apparatus only if aerosol or dust is formed.
Hand protection: Pvc or other plastic material gloves
Skin and body protection: Impervious clothing Long sleeved clothing
Eye protection: Safety glasses with side-shields
Hygiene measures: Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor	White to light brown; odorless or mild chemical odor
Physical state:	Solid
Formula:	C12H8Cl6O
Molecular weight:	380.93
Melting point/range:	177 °C
Boiling point/range:	Decomposes upon boiling.
Density:	1.75 (water = 1)
Vapor pressure:	Less than 8 x 10-7 mm Hg at 20 °C 7.78 x 10-7 mm Hg at 25 °C
Evaporation rate:	No data available
Vapor density:	13.2 (air = 1)
Solubility (in water):	Practically not soluble
Flash point:	Not determined
Autoignition temperature:	Not determined

10. STABILITY AND REACTIVITY

Stability:	Stable under recommended storage conditions.
Polymerization:	None under normal processing.
Hazardous decomposition products:	Chloride/Hydrochloric acid
Materials to avoid:	-

Strong oxidizers, active metals like sodium, strong acids, phenols

Conditions to avoid:	Exposure to air or moisture over prolonged periods.

11. TOXICOLOGICAL INFORMATION

Product Information

Acute toxicity

Components	**RTECS Number:**	**Selected LD50s and LC50s**
DIELDRIN	IO1750000	Inhalation LC50 Rat : 13 mg/m³/4H Oral LD50 Rat : 38300 ug/kg Oral LD50 Mouse : 38 mg/kg Dermal LD50 Rabbit : 250 mg/kg

Chronic toxicity:	Chronic exposure may cause nausea and vomiting, higher exposure causes unconsciousness.
Local effects:	Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Specific effects:	May include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache.
Primary irritation:	No data is available on the product itself.
Carcinogenic effects:	Possible carcinogen
Mutagenic effects:	No data is available on the product itself.
Reproductive toxicity:	No data is available on the product itself.

Components	**NIOSH - Health Effects**	**NIOSH - Target Organs**
DIELDRIN		CNS, liver, skin, kidneys (in animals: lung, liver, thyroid and adrenal gland tumors)

12. ECOLOGICAL INFORMATION

Mobility:	No data available

Bioaccumulation: No data available
Ecotoxicity effects: No data available
Aquatic toxicity: May cause long-term adverse effects in the aquatic environment.

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants	United Kingdom - The Red List:
DIELDRIN	Not Listed	DOT regulated severe marine pollutant	Original entry

Components	Germany VCI (WGK)	World Health Organization (WHO) - Drinking Water	Ecotoxicity - Fish Species Data
DIELDRIN	3	0.03 ug/L	Not Listed

Components	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Microtox Data	Ecotoxicity - Water Flea Data
DIELDRIN	Not Listed	Not Listed	Not Listed

Components	EPA - ATSDR Priority List	EPA - HPV Challenge Program Chemical List	California - Priority Toxic Pollutants
DIELDRIN	Rank (of 275): 018	Not Listed	Maximum concentration = 0.24 ug/L; continuous concentration = 0.056 ug/L

Components	California - Priority Toxic Pollutants	California - Priority Toxic Pollutants
DIELDRIN	Water and organisms = 0.00014 ug/L; organisms only = 0.00014 ug/L	Maximum concentration = 0.71 ug/L; continuous concentration = 0.0019 ug/L

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.

Contaminated packaging: Do not re-use empty containers

14. TRANSPORT INFORMATION

UN/Id No: 2761

DOT:

Proper shipping name: Organochlorine, pesticide, solid, toxic
IATA Hazard Label(s): Toxic
Hazard Class 6.1 **-**
Toxic substances - dermal
Packing group: II

Emergency Response Guide Number (ERG): 151

Components	U.S. DOT - Appendix A Table 1 - Reportable Quantities
DIELDRIN	RQ = 1 pound (0.454 kg); also listed as 2,7:3,6-Dimethanonaphth[2,3-b]oxirene, 3,4,5,6,9,9-hexachloro-1a,2,2a,3,6,6a,7,7a-octahydro-,(1a.alpha.,2.beta.,2a.alpha.,3.beta.,6.beta.,6a.alpha.,7.beta.,7a.a

TDG (Canada):

WHMIS hazard class: D1b toxic materials

:

IMDG/IMO

Proper shipping name: Organochlorine, pesticide, solid, toxic

IMDG - Hazard Classifications Not Applicable

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants
DIELDRIN	Not Listed	DOT regulated severe marine pollutant

IMO-labels:

15. REGULATORY INFORMATION

International Inventories

Components
DIELDRIN

Inventory - United States TSCA - Sect. 8(b)	Not Listed
Canada DSL Inventory List -	Not Listed
Australia (AICS):	Present
Inventory - China:	Present
EU EINECS List -	200-484-5; C12H8Cl6O
Inventory - Japan:	4-299
Korean KECL:	KE-18415
Philippines PICCS:	Present

U.S. regulations:

Components	California Proposition 65 -	Massachusetts Right to Know List:	New Jersey Right to Know List:	Pennsylvania Right to Know List:
DIELDRIN	carcinogen; initial date 7/1/88	carcinogen; extraordinarily hazardous	sn 0683	environmental hazard

Components	Florida substance List:	Rhode Island Right to Know List:	Illinois - Toxic Air Contaminants	Connecticut - Hazardous Air Pollutants
DIELDRIN	[present]	Toxic; skin	B2 Carcinogen, Present on Great Waters or Great Lakes list	5 ug/m^3 HLV

Components	SARA 313 Emission reporting/Toxic Release of Chemicals	CERCLA/SARA - Section 302 Extremely Haz	NTP:	IARC:
DIELDRIN	Not Listed	Not Listed	None	None

SARA 313 Notification: The above is your notification as to the SARA 313 listing for this product(s) pursuant to Section 313 of Title III of the Superfund Ammendments and Reauthorization Act of 1986 and 40 CFR Part 372.

If you are unsure if you are subject to the reporting requirements of Section 313, or need more information, please call the EPA Emergency Planning and Community Right-To-Know Information Hotline: (800) 535-0202 or (202) 479-2499 (in Washington, DC or Alaska).

State Notification: The above information is your notice as to the Right-to-Know listings of the stated product(s). Individual states will list chemicals for a variety of reasons including, but not limited to, the compounds toxicity; carcinogenic, tumorigenic and/or reproductive hazards; and the compounds environmental impact if accidentally released.

16. OTHER INFORMATION

Prepared by: Health & Safety
Disclaimer: The information and recommendations contained herein are based upon tests believed to be reliable. However, MP Biomedicals does not guarantee the accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage maybe required. MP Biomedicals assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

SIGMA-ALDRICH

MATERIAL SAFETY DATA SHEET

Date Printed: 05/01/2006
Date Updated: 02/05/2006
Version 1.3

Section 1 - Product and Company Information

Product Name	DIBENZOFURAN
Product Number	42980
Brand	FLUKA
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
DIBENZOFURAN	132-64-9	Yes

Formula	C12H8O
Synonyms	2,2'-Biphenylene oxide * 2,2'-Biphenylylene oxide * Dibenzo(b,d)furan * Diphenylene oxide
RTECS Number:	HP4430000

Section 3 - Hazards Identification

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLASH POINT
266 °F 130 °C Method: closed cup

AUTOIGNITION TEMP

N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.

Section 6 - Accidental Release Measures

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid contact and inhalation. Do not get in eyes, on skin, on clothing.

STORAGE
Suitable: Keep tightly closed. Store in a cool dry place.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Mechanical exhaust required.

WORK PRACTICES
Use with adequate ventilation.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks.
Hand: Rubber gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse.

Section 9 - Physical/Chemical Properties

Appearance	Color: White Form: Crystals	
Property	Value	At Temperature or Pressure
Molecular Weight	168.2 AMU	
pH	N/A	

BP/BP Range	285 °C	760 mmHg
MP/MP Range	83 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	266 °F 130 °C	Method: closed cup
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Multiple Routes: May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - MUTAGEN

Species: Hamster
Dose: 10 MG/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Dissolve or mix the material with a combustible solvent and burn

in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
S: 22-24/25
Safety Statements: Do not breathe dust. Avoid contact with skin and eyes.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MATERIAL SAFETY DATA SHEET

Date Printed: 12/16/2011
Date Updated: 05/07/2009
Version 1.4

Section 1 - Product and Company Information

Product Name	1,2:5,6-DIBENZANTHRACENE, 97% (NO BULK ORDERS ALLOWED)
Product Number	D31400
Brand	ALDRICH
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,2:5,6-DIBENZANTHRACENE	53-70-3	Yes

Formula C22H14
Synonyms 1,2:5,6-Benzanthracene * DB(a,h)A * 1,2,5,6-Dba *
1,2,5,6-Dibenzanthraceen (Dutch) *
1,2:5,6-Dibenzanthracene *
1,2:5,6-Dibenz(a)anthracene *
Dibenzo(a,h)anthracene *
1,2:5,6-Dibenzoanthracene * RCRA waste number U063
RTECS Number: HN2625000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Toxic. Dangerous for the environment.
May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

HMIS RATING
HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING
HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	0.004 MG/M3
Poland		NDSCh	-
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance Physical State: Solid

Property	Value	At Temperature or Pressure
Molecular Weight	278.35 AMU	
pH	N/A	
BP/BP Range	524 °C	760 mmHg
MP/MP Range	262 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Lungs. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Intratracheal
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 4160 MG/KG
Exposure Time: 26W
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors.
Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Skin
Dose: 1200 MG/KG
Exposure Time: 50W
Frequency: I
Result: Tumorigenic:Tumors at site or application.
Tumorigenic:Carcinogenic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 445 UG/KG
Result: Skin and Appendages: Other: Tumors.
Tumorigenic:Carcinogenic by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Intravenous
Dose: 40 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Liver:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 80 MG/KG
Result: Kidney, Ureter, Bladder:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Multiple
Dose: 40 MG/KG
Exposure Time: 12D
Frequency: I
Result: Tumorigenic:Tumors at site or application. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Guinea pig
Route of Application: Subcutaneous
Dose: 250 MG/KG
Exposure Time: 24D
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application. Lungs, Thorax, or Respiration:Tumors.

Species: Guinea pig
Route of Application: Intravenous
Dose: 30 MG/KG
Result: Tumorigenic:Tumors at site or application. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Equivocal tumorigenic agent by RTECS criteria.

Species: Pigeon
Route of Application: Intramuscular
Dose: 6 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors. Tumorigenic:Tumors at site or application.

Species: Frog
Route of Application: Intrarenal
Dose: 12 MG/KG
Result: Kidney, Ureter, Bladder:Kidney tumors. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Neoplastic by RTECS criteria.

Species: Mouse
Route of Application: Implant
Dose: 14 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 78 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse

Route of Application: Oral
Dose: 4520 MG/KG
Exposure Time: 36W
Frequency: C
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Gastrointestinal:Tumors.

Species: Mouse
Route of Application: Implant
Dose: 200 MG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 6 UG/KG
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Subcutaneous
Dose: 6 MG/KG
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Skin
Dose: 400 MG/KG
Exposure Time: 40W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Implant
Dose: 100 MG/KG
Result: Tumorigenic:Carcinogenic by RTECS criteria. Kidney, Ureter, Bladder:Tumors. Tumorigenic:Tumors at site or application.

Species: Rat
Route of Application: Subcutaneous
Dose: 135 MG/KG
Exposure Time: 9W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Tumorigenic:Tumors at site or application.

Species: Mouse
Route of Application: Subcutaneous
Dose: 400 MG/KG
Exposure Time: 10W
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Tumorigenic:Tumors at site or application.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

CHRONIC EXPOSURE - MUTAGEN
Result: Laboratory experiments have shown mutagenic effects.

Species: Human
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Human
Dose: 100 UMOL/L
Cell Type: fibroblast
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 10 MG/L
Cell Type: Other cell types
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 100 NMOL/L
Cell Type: HeLa cell
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 54 UG/L
Cell Type: lymphocyte
Mutation test: Mutation in mammalian somatic cells.

Species: Rat
Route: Intratracheal
Dose: 25500 UG/KG
Exposure Time: 16H
Mutation test: Micronucleus test

Species: Rat
Route: Oral
Dose: 200 MG/KG
Mutation test: Morphological transformation.

Species: Rat
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Rat
Route: Intratracheal
Dose: 25560 UG/KG
Mutation test: DNA

Species: Rat
Route: Intratracheal
Dose: 51150 UG/KG
Mutation test: Sister chromatid exchange

Species: Mouse
Route: Intraperitoneal
Dose: 500 MG/KG
Mutation test: Micronucleus test

Species: Mouse
Dose: 4250 UG/L (+S9)
Cell Type: lymphocyte
Mutation test: Mutation in microorganisms

Species: Mouse
Dose: 500 UG/L
Cell Type: fibroblast
Mutation test: Morphological transformation.

Species: Mouse
Dose: 100 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Dose: 6 UMOL/L
Cell Type: liver
Mutation test: DNA

Species: Mouse
Route: Skin
Dose: 40 UMOL/KG
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: DNA

Species: Mouse
Dose: 1 MG/L
Cell Type: Other cell types
Mutation test: Other mutation test systems

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Mouse
Dose: 510 NMOL/L
Cell Type: Embryo
Mutation test: Other mutation test systems

Species: Hamster
Dose: 56400 NMOL/L (+S9)
Cell Type: lung
Mutation test: Mutation in microorganisms

Species: Hamster
Dose: 2500 UG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 25 UG/L
Cell Type: kidney
Mutation test: Morphological transformation.

Species: Hamster
Dose: 5 MG/L

Exposure Time: 24H
Cell Type: fibroblast
Mutation test: DNA damage

Species: Hamster
Dose: 360 NMOL/L
Cell Type: Embryo
Mutation test: DNA

Species: Hamster
Dose: 5 MG/L
Cell Type: kidney
Mutation test: DNA damage

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: DNA

Species: Hamster
Dose: 1 MG/L
Cell Type: lung
Mutation test: Other mutation test systems

Species: Hamster
Dose: 1 MMOL/L
Cell Type: fibroblast
Mutation test: Cytogenetic analysis

Species: Hamster
Route: Intraperitoneal
Dose: 900 MG/KG
Exposure Time: 24H
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 500 UG/L
Cell Type: lung
Mutation test: Mutation in mammalian somatic cells.

Species: Mammal
Dose: 2 NMOL/L
Cell Type: lymphocyte
Mutation test: DNA damage

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Dannish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous

substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 45-50/53
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 53-45-60-61
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: May cause cancer. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Wear suitable protective clothing, gloves, and eye/face protection. This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Target organ(s): Lungs. Liver. Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION

WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.

DSL: No

NDSL: Yes

Section 16 - Other Information

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2010 Sigma-Aldrich Co. License granted to make unlimitedpaper copies for internal use only.

MSDS Safety Information

TOP

FSC:	MSDS Date:	MSDS Num:
6810	03/10/1988	BHCDX

Submitter:	LIIN:	Tech Review:	Status CD:
N EN	00N010730	02/20/1989	C

Product ID:	MFN:
DELT−BHC, 50MG,CATALOG NO 48495	01

Article:	Kit Part:
N	N

Cage:

Responsible Party HO582

Name:

SUPELCO,INC.

Address:

SUPELCO PARK

City:	State:	Zip:
BELLEFONTE	PA	16823−0048

Country:

NK

Info Phone Number:

814−359−3441

Emergency Phone Number:

814−359−3441

Preparer's Name:

N/P

Proprietary Ind:

N

Review Ind: Y

Published: Y

Special Project CD: N

Contractor Summary

TOP

Cage:	Name:
54968	SIGMA−ALDRICH INC.

Address:	Box:
3050 SPRUCE STREET	14508

City:	State:	Zip:
ST. LOUIS	MO	63103

Country:	Phone:
US	314−771−5765/414−273−3850X5996

Cage:	Name:
HO582	SUPELCO,INC.

Address:

SUPELCO PARK

City: State: Zip:

BELLEFONTE PA 16823−0048

Country: NK **Phone:** 814−359−3441

Ingredients

TOP

Cas: 319−86−8 M GV4550000 M

Code: RTECS #: Code:

Name: **DELTA−BHC (SARA III)**

% Text: N/K FPN Environmental Wt:

Other REC Limits: N/K FPN

OSHA PEL:

NOT ESTABLISHED Code: M OSHA STEL: Code:

ACGIH TLV: NOT ESTABLISHED Code: M ACGIH STEL: N/P Code:

EPA Rpt Qty: 1 LB DOT Rpt Qty: 1 LB

Ozone Depleting Chemical:

N

Health Hazards Data

TOP

LD50 LC50 Mixture

LD50 1000 MG/KG ORAL RAT

Route Of Entry Inds − Inhalation:NO Skin:NO Ingestion:NO

Carcinogenicity Inds − NTP:NO IARC:NO OSHA:NO

Health Hazards Acute And Chronic

ANIMAL SUSPECT(MFR).

Explanation Of Carcinogenicity

ANIMAL SUSPECT(MFR)

Signs And Symptions Of Overexposure

IRRITATES EYES,IRRITATES SKIN.

Medical Cond Aggravated By Exposure

N/K FPN.

First Aid

EYES:FLUSH WITH PLENTY OF POTABLE WATER FOR AT LEAST 15 MIN,THEN OBTAIN PROMPT MEDICAL ATTENTION (FP N).SKIN:FLUSH SKIN WITH LARGE VOLUMES OF WATER.INHALATION:IMMEDIATELY MOVE TO FRESH AIR,GIVE OXYGE N IF BREATHING IS LABORED,CONTACT A PHYSICIAN.INGESTION:CALL MD IMMEDIATELY(FPN).NEVER GIVE ANYTHING BY MOUTH TO AN UNCONSCIOUS PERSON,NEVER TRY TO MAKE AN UNCONCIOUS PERSON VOMIT.

Spill Release Procedures

SWEEP UP MATERIAL,TAKE UP WITH ABSORBENT MATERIAL.

Neutralizing Agent

N/K FPN

Waste Disposal Methods

COMPLY WITH ALL APPLICABLE FEDERAL,STATE,OR LOCAL REGULATIONS.

Handling And Storage Precautions

STORE IN SEALED CONTAINER IN COOL,DRY LOCATION.

Other Precautions

AVOID EYE OR SKIN CONTACT.

========== Fire and Explosion Hazard Information ========== TOP

Flash Point Method:

N/P

Flash Point:

Flash Point Text: N/A MFR

Autoignition Temp:

Autoignition Temp Text: N/A

Lower Limits: N/K FPN

Upper Limits: N/K FPN

Extinguishing Media

WATER,CO*2,DRY CHEMICAL.

Fire Fighting Procedures

USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT(FPN).NEAR SCBA WHWN FIGHTING A CHEMICAL FIRE(MFR).

Unusual Fire/Explosion Hazard

THE FOLLOWING TOXIC VAPORS ARE FORMED WHEN THIS MATERIAL IS HEATED TO DECOMPOSITION,CHLORIDES.

========== Control Measures ========== TOP

Respiratory Protection

NIOSH/MSHA APPROVED RESPIRATOR APPROPRIATE FOR EXPOSURE OF CONCERN(FPN).

Ventilation

USE ONLY IN WELL VENTILATED AREA.

Protective Gloves

N/A

Eye Protection

CHEMICAL WORKERS GOGGLES(FPN).

Other Protective Equipment

N/A

Work Hygienic Practices

OBSERVE GOOD WORK HYGIENE PRACTICES(FPN).

Supplemental Safety and Health

N/P

========== Physical/Chemical Properties ========== TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point: B.P. Text: N/A MFR

Melt/Freeze Pt: M.P/F.P Text: 280 F;138 C

Decomp Temp: Decomp Text: N/K FPN

Vapor Pres: N/AMFR Vapor Density: N/AMFR

Volatile Org Content %: Spec Gravity: N/A MFR

VOC Pounds/Gallon:

PH: N/AMFR

VOC Grams/Liter: Viscosity: N/P

Evaporation Rate & Reference: N/A MFR.

Solubility in Water: N/A FPN.

Appearance and Odor: WHITE POWDER

Percent Volatiles by Volume: N/AMFR Corrosion Rate: N/AMFR

========== Reactivity Data ==========

TOP

Stability Indicator:

YES

Stability Condition To Avoid: REACT VIOLENTLY WITH KETONES AND WIDE VARIETY OF OTHER COMPOUNDS.

Materials To Avoid: N/A

Hazardous Decomposition Products: CHLORIDES.

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization WILL NOT OCCUR.

:

========== Toxicological Information ==========

TOP

Toxicological Information:

N/P

========== Ecological Information ==========

TOP

Ecological:

N/P

========== MSDS Transport Information ==========

TOP

Transport Information:

N/P

========== Regulatory Information ========== TOP

Sara Title III Information:

N/P

Federal Regulatory Information: N/P

State Regulatory Information: N/P

========== Other Information ========== TOP

Other Information:

N/P

==========

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Material Safety Data Sheet

Version 4.2
Revision Date 05/27/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Sodium cyanide
Product Number	:	380970
Brand	:	Sigma-Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect, Highly toxic by inhalation, Highly toxic by ingestion, Highly toxic by skin absorption

Target Organs

Central nervous system, Blood, Lungs, Cardiovascular system., Thyroid.

GHS Classification
Acute toxicity, Oral (Category 1)
Acute toxicity, Inhalation (Category 2)
Acute toxicity, Dermal (Category 1)
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H300 + H310	Fatal if swallowed or in contact with skin.
H330	Fatal if inhaled.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash hands thoroughly after handling.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P284	Wear respiratory protection.
P302 + P350	IF ON SKIN: Gently wash with plenty of soap and water.
P310	Immediately call a POISON CENTER or doctor/ physician.

HMIS Classification

Health hazard: 4
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating
Health hazard: 4
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be fatal if inhaled. May cause respiratory tract irritation.
Skin May be fatal if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be fatal if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : CNNa
Molecular Weight : 49.01 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Sodium cyanide			
143-33-9	205-599-4	006-007-00-5	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Dry powder

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Do not flush with water. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.
Never allow product to get in contact with water during storage. Do not store near acids.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Sodium cyanide	143-33-9	TWA	5 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
Remarks	Skin designation			
		C	5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Upper Respiratory Tract irritation Headache Nausea Thyroid effects Danger of cutaneous absorption varies			
		TWA	5 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		C	4.7 ppm 5 mg/m3	USA. NIOSH Recommended Exposure Limits
	10 minute ceiling value			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	white

Safety data

pH	11.0 - 12.0 at 49.0 g/l at 25 °C (77 °F)
Melting point/freezing point	Melting point/range: 563.7 °C (1,046.7 °F) - lit.
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	1 hPa (1 mmHg) at 817 °C (1,503 °F)
Density	no data available
Water solubility	ca.49 g/l at 20 °C (68 °F)
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Do not store near acids., Strong oxidizing agents, Carbon dioxide (CO_2)

Hazardous decomposition products
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 4.8 mg/kg
Remarks: Behavioral:Tetany. Behavioral:Ataxia. Lungs, Thorax, or Respiration:Respiratory obstruction.

Inhalation LC50
no data available

Dermal LD50

LD50 Dermal - rabbit - 10.4 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Tremor. Lungs, Thorax, or Respiration:Dyspnea.

Other information on acute toxicity
LD50 Intramuscular - rabbit - 1.666 mg/kg

LD50 Intraperitoneal - rat - 4.3 mg/kg

LD50 Intraperitoneal - mouse - 4.9 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Reproductive toxicity - rat - Oral
Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count). Paternal Effects: Testes, epididymis, sperm duct.
Reproductive toxicity - Hamster - Implant
Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).
Specific Developmental Abnormalities: Central nervous system.

no data available

Teratogenicity

Developmental Toxicity - Hamster - Implant
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Cardiovascular (circulatory) system.

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be fatal if inhaled. May cause respiratory tract irritation.
Ingestion	May be fatal if swallowed.

Skin	May be fatal if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin., Cough, Shortness of breath, Headache, Nausea

Synergistic effects
no data available

Additional Information
RTECS: VZ7525000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.05 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	LC50 - Daphnia magna (Water flea) - 0.09 mg/l - 96 h
Toxicity to algae	EC50 - Nitzschia closterium - 0.051 mg/l - 72 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1689 Class: 6.1 Packing group: I
Proper shipping name: Sodium cyanide, solid
Reportable Quantity (RQ): 10 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 1689 Class: 6.1 Packing group: I EMS-No: F-A, S-A
Proper shipping name: SODIUM CYANIDE, SOLID
Marine pollutant: No

IATA
UN number: 1689 Class: 6.1 Packing group: I

Proper shipping name: Sodium cyanide, solid

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect, Highly toxic by inhalation, Highly toxic by ingestion, Highly toxic by skin absorption

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Sodium cyanide	143-33-9	1993-04-24

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Sodium cyanide	143-33-9	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Sodium cyanide	143-33-9	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Sodium cyanide	143-33-9	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.2
Revision Date 06/29/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Copper
Product Number	:	12806
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable solid, Target Organ Effect

Target Organs

Lungs

GHS Classification
Flammable solids (Category 1)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H228	Flammable solid
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P273	Avoid release to the environment.
P501	Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	3

NFPA Rating

Health hazard:	0

Fire: 3
Reactivity Hazard: 3

Health hazard: 0
Fire: 3
Reactivity Hazard: 3

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Cu
Molecular Weight : 63.54 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Copper			
7440-50-8	231-159-6	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition, through friction or retained heat. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Copper oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Copper	7440-50-8	TWA	1 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Irritation Gastrointestinal metal fume fever			
		TWA	1 mg/m3	USA. NIOSH Recommended Exposure Limits
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	1 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Irritation Gastrointestinal metal fume fever			
		TWA	0.1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.1 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	Turnings
Colour	light red

Safety data

pH	no data available
Melting point/freezing point	no data available
Boiling point	no data available
Flash point	no data available
Flammability (solid, gas)	The substance or mixture is a flammable solid with the subcategory 1.
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	8.940 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Strong acids, Strong oxidizing agents, Acid chlorides, Halogens

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Copper oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
LD50 Intraperitoneal - mouse - 3.5 mg/kg

Skin corrosion/irritation
May irritate skin.

Serious eye damage/eye irritation
May irritate eyes.

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

Symptoms of systemic copper poisoning may include: capillary damage, headache, cold sweat, weak pulse, and kidney and liver damage, central nervous system excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson's disease. It has also been reported that copper poisoning has lead to hemolytic anemia and accelerates arteriosclerosis.

Synergistic effects
no data available

Additional Information
RTECS: GL5325000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 0.022 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	mortality NOEC - Daphnia - 0.004 mg/l - 24 h
	EC50 - Daphnia magna (Water flea) - 0.04 - 0.05 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Cyprinus carpio (Carp) - 40 d Bioconcentration factor (BCF): 108

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powders, flammable, n.o.s.
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 3089 Class: 4.1 Packing group: II EMS-No: F-G, S-G
Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S.
Marine pollutant: No

IATA
UN number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powder, flammable, n.o.s.

15. REGULATORY INFORMATION

OSHA Hazards
Flammable solid, Target Organ Effect

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
The following components are subject to reporting levels established by SARA Title III, Section 313:

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Copper	7440-50-8	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
Copyright 2011 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet
Chrysene, 98%

ACC# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name: Chrysene, 98%
Catalog Numbers: AC224140000, AC224140010, AC224140050, AC224145000, NC9381297, XXAC22414-300G
Synonyms: 1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.
Company Identification:
Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410
For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
218-01-9	Chrysene	98	205-923-4

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: very light beige solid.
Caution! May cause eye and skin irritation. May cause respiratory tract irritation. May cause cancer in humans.
Target Organs: Liver, skin.

Potential Health Effects
Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation: May cause respiratory tract irritation.
Chronic: May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.
Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while

removing contaminated clothing and shoes. Wash clothing before reuse.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.
Flash Point: Not applicable.
Autoignition Temperature: Not available.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: ; Flammability: 1; Instability:

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.
Storage: Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA (cyclohexane-extractable fraction) (listed under Coal tar pitches).80 mg/m3 IDLH (listed under Coal tar pitches).	0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Solid
Appearance: very light beige
Odor: Not available.
pH: Not available.
Vapor Pressure: Not available.
Vapor Density: Not available.
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 448 deg C @ 760 mm Hg
Freezing/Melting Point:250-255 deg C
Decomposition Temperature: Not available.
Solubility: insoluble
Specific Gravity/Density: Not available.
Molecular Formula:C18H12
Molecular Weight:228.29

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Dust generation.
Incompatibilities with Other Materials: Strong oxidizing agents.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

Section 11 - Toxicological Information

RTECS#:
CAS# 218-01-9: GC0700000
LD50/LC50:
Not available.

Carcinogenicity:
CAS# 218-01-9:

- **ACGIH:** A3 - Confirmed animal carcinogen with unknown relevance to humans
- **California:** carcinogen, initial date 1/1/90

- **NTP:** Known carcinogen (listed as Coal tar pitches).
- **IARC:** Group 1 carcinogen (listed as Coal tar pitches).

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: Chrysene was mutagenic to S. Typhimurium in the presence of an exogenous metabolic system.
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified Fish toxicity : LC50 (96hr) Neauthes arenacedentata >1ppm.(Rossi,S.S. et al Marine Pollut. Bull. 1978) Invertebrate toxicity : lethal treshold concentration (24hr) Daphnia Magna 0,7æg/l.(* Newsted,J.L. et al Environ. Toxicol. Chem. 1987) Bioaccumulation : 24hr Daphnia Magna log bioconcentration factor 3.7845 (*)
Environmental: Degradation studies : biodegradated by white rot fungus (Proc.Annu.Meet.Am.Wood-Preserv.Assoc.1989) May be utilised by axenic cultures of microorganisms e.g. Pseudomonas pancimobilis EPA505, which may have novel degradative systems(Mueller,J.G. et al ppl.Environ.Microbiol.1990; Mueller, J.G. et al Environ.Sci.Technol.1991).
Physical: Not found.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 218-01-9: waste number U050.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	ENVIRONMENTALLY HAZARDOUS SUBSTANCES, SOLID, N.O.S.	No information available.
Hazard Class:	9	
UN Number:	UN3077	
Packing Group:	III	

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 218-01-9 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313
This material contains Chrysene (CAS# 218-01-9, 98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA.
CAS# 218-01-9 is listed as a Priority Pollutant under the Clean Water Act.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 218-01-9 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65
The following statement(s) is(are) made in order to comply with the California Safe Drinking Water Act:
WARNING: This product contains Chrysene, a chemical known to the state of California to cause cancer.
California No Significant Risk Level: CAS# 218-01-9: 0.35 æg/day NSRL (oral)

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
T
Risk Phrases:
R 45 May cause cancer.
R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S 53 Avoid exposure - obtain special instructions before use.
S 60 This material and its container must be disposed of as hazardou s waste.

S 61 Avoid release to the environment. Refer to special instructions /safety data sheets.

WGK (Water Danger/Protection)

CAS# 218-01-9: No information available.

Canada - DSL/NDSL

CAS# 218-01-9 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of D2A.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 218-01-9 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 6/30/1999
Revision #5 Date: 3/15/2007

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Material Safety Data Sheet

Version 4.1
Revision Date 03/15/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Chromium
Product Number	:	374849
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect

Target Organs

Liver, Kidney

GHS Classification
Acute aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H400 Very toxic to aquatic life.

Precautionary statement(s)
P273 Avoid release to the environment.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	0
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.

Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Cr
Molecular Weight : 52.00 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Chromium			
7440-47-3	231-157-5	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Not flammable or combustible.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Chromium oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Chromium	7440-47-3	TWA	0.5 mg/m3	USA. NIOSH Recommended Exposure Limits
Remarks	See Appendix C			
		TWA	0.5 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Upper Respiratory Tract & skin irritation Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.			
		TWA	1 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	1 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	chips
Colour	light grey

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 1,857 °C (3,375 °F) - lit.
Boiling point	2,672 °C (4,842 °F) - lit.
Flash point	not applicable
Ignition temperature	no data available

Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	7.14 g/mL at 25 °C (77 °F)
Water solubility	insoluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong acids, Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Chromium oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Carcinogenicity - rabbit - Implant
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Carcinogenicity - rat - Implant
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Blood:Lymphomas including Hodgkin's disease. Tumorigenic:Tumors at site or application.

Carcinogenicity - rat - Intravenous
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Gastrointestinal:Tumors. Blood:Lymphomas including Hodgkin's disease.

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Chromium)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: GB4200000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality NOEC - Pimephales promelas (fathead minnow) - 12 mg/l - 7 d

	mortality LOEC - Pimephales promelas (fathead minnow) - 2.4 mg/l - 7 d
	LC50 - Cyprinus carpio (Carp) - 14.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 0.07 mg/l - 48 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 30 d Bioconcentration factor (BCF): 1.03 - 1.22

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chromium)
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chromium)
Marine pollutant: No

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chromium)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chromium	7440-47-3	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
Copyright 2011 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS Safety Information

TOP

FSC: 6810 **NIIN:** 00−222−2639 **MSDS Date:** 02/24/1998 **MSDS Num:** CKWBP

Submitter: D DG **Tech Review:** 11/16/2000 **Status CD:** A

Product ID: 14458, CHLOROFORM **MFN:** 01

Article: N **Kit Part:** N

Responsible Party **Cage:** 91224

Name: HACH COMPANY

Box: 389

City: LOVELAND **State:** CO **Zip:** 80539

Country: US

Info Phone Number: 970−669−3050

Emergency Phone Number: 303−623−5716

Resp. Party Other MSDS No.: MSDS #: M00190

Proprietary Ind: N Review Ind: Y

Published: Y Special Project CD:

Contractor Summary

TOP

Cage:91224 **Name:**HACH CO

Address:5600 LINDBERGH DR **Box:**389

City:LOVELAND **State:**CO **Zip:**80539

Country:US **Phone:**970−669−3050/ 303−623−5716

Item Description Information

TOP

Item Manager: S9G

Item Name: CHLOROFORM,ACS

Specification Number: O−C−265C Type/Grade/Class: NONE

Unit of Issue: BT Quantitative Expression: 00000000005PT

UI Container Qty: 4 Type of Container: BOTTLE

Ingredients

TOP

Cas: 67−66−3 Code: T RTECS #: FS9100000 Code: T

Name: **CHLOROFORM**

Environmental Wt:

Other REC Limits: PEL(MSDS): 2 PPM

OSHA PEL: C240 MG/M3;C50 PPM Code: T OSHA STEL: N/P Code:

ACGIH TLV:	49 MG/M3;10 PPM	Code: T	ACGIH STEL:	NOT ESTABLISHED	Code: T
EPA Rpt Qty:	10 LBS		DOT Rpt Qty:	10 LBS	

Ozone Depleting Chemical: N

========== Health Hazards Data ==========

TOP

LD50 LC50 Mixture LD50 ORAL RAT = 908 MG/KG

Route Of Entry Inds − Inhalation:	YES	Skin:	YES	Ingestion:	N/P
Carcinogenicity Inds − NTP:	YES	IARC:	YES	OSHA:	NO

Health Hazards Acute And Chronic

TARGET ORGANS: CENTRAL NERVOUS SYSTEM, KIDNEY, LIVER. EYE: MAY CAUSE IRRITATION. SKIN: NO EFFECTS ARE ANTICIPATED. SKIN ABSORPTION: HARMFUL IF ABSORBED THROUGH SKIN. CAUSES: CENTRAL NERVOUS SYSTEM DEP RESSION, KIDNEY DAMAGE, LIVER DAMAGE. INGESTION: CAUSES: CENTRAL NERVOUS SYSTEM DEPRESSION, KIDNEY DAMAGE, LIVER DAMAGE. INHALATION: CAUSES: CENTRAL NERVOUS SYSTEM DEPRESSION, KIDNEY DAMAGE, LIVER D AMAGE. CHRONIC: NONE REPORTED.

Explanation Of Carcinogenicity

NTP: REASONABLE ANTICIPATED CARCINOGEN. IARC: 2B, POSSIBLY CARCINOGENIC TO HUMANS. PER MSDS IT'S LISTED BY OSHA.

Signs And Symptions Of Overexposure

NONE PROVIDED BY MFR. HMIS: IRRITATION OF EYES, CNS DEPRESSION, LIVER AND KIDNEY DAMAGE.

Medical Cond Aggravated By Exposure

PRE−EXISTING CNS DISEASE, KIDNEY AND LIVER CONDITIONS.

First Aid

EYE: IMMEDIATELY FLUSH EYES WITH WATER FOR 15 MINS. CALL PHYSICIAN. SKIN: WASH SKIN WITH SOAP & PLENTY OF WATER. INGESTION: DO NOT INDUCE VOMITING. CALL PHYSICIAN IMMEDIATELY. INHALATION: REMOVE TO FR ESH AIR. GIVE ARTIFICIAL RESPIRATION IF NECESSARY. CALL PHYSICIAN.

Spill Release Procedures

RELEASES OF THIS MATERIAL MAY CONTAMINATE THE ENVIRONMENT. ABSORB SPILLED LIQUID WITH NON−REACTIVE SORBENT MATERIAL. STOP SPILLED MATERIAL FROM BEING RELEASED TO ENVIRONMENT. DIKE THE SPILL TO CONTAIN THE MATERIAL, RECOVER OR ABSORB IN INERT MATERIAL FOR LATER DISPOSAL.

Neutralizing Agent

DECONTAMINATE THE SPILL AREA WITH SOAP SOLUTION.

Waste Disposal Methods

EPA WASTE ID NUMBER: D022, U044. DISPOSE OF MATERIAL IN AN E.P.A. APPROVED HAZARDOUS WASTE FACILITY. EMPTY CONTAINERS: RINSE THREE TIMES WITH AN APPROPRIATE SOLVENT. DISPOSE OF EMPTY CONTAINER AS NOR MAL TRASH. DISPOSAL MUST BE IN ACCORDANCE WITH LOCAL, STATE AND FEDERAL REGULATIONS.

Handling And Storage Precautions

HANDLING: AVOID CONTACT WITH EYES, SKIN, CLOTHING. DO NOT BREATHE MIST OR VAPORS. WASH THOROUGHLY AFTER HANDLING. USE WITH ADEQUATE VENTILATION. MAINTAIN GENERAL INDUSTRIAL HYGIENE PRACTICES WHEN USIN G THIS PRODUCT. STORAGE: PROTECT FROM: LIGHT, AIR. STORE IN A COOL, WELL−VENTILATED PLACE.

Other Precautions

AVOID CONTACT WITH: EYES, SKIN, CLOTHING. DO NOT BREATHE: MIST/VAPOR. WASH THOROUGHLY AFTER HANDLING. USE WITH ADEQUATE VENTILATION. KEEP AWAY FROM: ALKALI METALS, ALKALIES.

========== Fire and Explosion Hazard Information ==========

TOP

Flash Point Method: N/A

Flash Point:

Flash Point Text: NOT APPLICABLE

Autoignition Temp:

Autoignition Temp Text: NOT AP

Lower Limits: NOT APPLICAB

Upper Limits: NOT APPLICAB

Extinguishing Media

CARBON DIOXIDE, ALCOHOL FOAM, DRY CHEMICAL

Fire Fighting Procedures

AS IN ANY FIRE, WEAR SELF CONTAINED BREATHING APPARATUS PRESSURE−DEMAND & FULL PROTECTIVE GEAR. EVACUATE AREA & FIGHT FIRE FROM A SAFE DISTANCE. WATER RUNOFF CAN CAUSE ENVIROMENTAL DAMAGE. DIKE & COLL ECT WATER USED TO FIGHT FIRE.

Unusual Fire/Explosion Hazard

MAY REACT VIOLENTLY WITH: ALKALI METALS, ALUMINUM/ALUMINUM COMPOUNDS, STRONG BASES. THIS MATERIAL WILL NOT BURN. DURING A FIRE, CORROSIVE & TOXIC GASES MAY BE GENERATED BY THERMAL DECOPOSITION.

========== Control Measures ==========

TOP

Respiratory Protection

USE A FUME HOOD TO AVOID EXPOSURE TO DUST, MIST OR VAPOR.

Ventilation

LABORATORY FUME HOOD

Protective Gloves

PVA (POLYVINYL ALCOHOL) GLOVES

Eye Protection

CHEMICAL SPLASH GOGGLES

Other Protective Equipment

LAB COAT, EYEWASH STATION, SAFETY SHOWER. .

Work Hygienic Practices

MAINTAIN GENERAL INDUSTRIAL HYGIENE PRACTICES WHEN USING THIS PRODUCT. WASH THOROUGHLY AFTER HANDLING.

Supplemental Safety and Health

DO NOT BREATH MIST/VAPORS. AVOID CONTACT WITH EYES, SKIN AND CLOTHING.

========== Physical/Chemical Properties ==========

TOP

HCC: T4 NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point: =61.C, 141.8F B.P. Text:

Melt/Freeze Pt: =−64.C, −83.2F M.P/F.P Text:

Decomp Temp: Decomp Text: NONE PROVIDED BY MFR.

Vapor Pres: 159 MMHG @ 20 DEG C Vapor Density: 4.1 @B.P.

Volatile Org Content %: 100 Spec Gravity: 1.49 @ 20 DEG C (WATER=1)

VOC Pounds/Gallon: PH: NOT DETERMINED

VOC Grams/Liter: Viscosity: NONE PROVIDED BY MFR.

Evaporation Rate & Reference: C/CE. PLEASE FILL OUT THI

Solubility in Water: 1ML IN 200ML WATER @ 25C

Appearance and Odor: CLEAR, COLORLESS, LIQUID, ETHER−LIKE ODOR

Percent Volatiles by Volume: NONE PROVIDE Corrosion Rate: NOT DETERMINED

========== Reactivity Data ========== TOP

Stability Indicator: YES

Stability Condition To Avoid: EXPOSURE TO AIR. EXPOSURE TO LIGHT. EXTREME TEMPERATURES. HEATING TO DECOMPOSITION.

Materials To Avoid: ALKALI METALS, ALKALIES, ALUMINUM, CAUSTICS COATINGS (SUCH AS PAINT, VARNISH, WAX, LACQUER, ETC.) PLASTICS, RUBBER.

Hazardous Decomposition Products: HEATING TO DECOMPOSITION RELEASES TOXIC CORROSIVE FUMES OF: PHOSGENE CHLORIDES, CARBON MONOXIDE

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization WILL NOT OCCUR

:

========== Toxicological Information ========== TOP

Toxicological Information: LD50: ORAL RAT =908 MG/KG; ORAL MOUSE = 36 MG/KG. LC50: INHALATION RAT LC50 = 47,702 MG/M3/4HRS. DERMAL TOXICITY DATA: SKIN RABBIT LD50 =>20 G/KG. SKIN AND EYE IRRITATION DATA: SKIN RABBIT (DRAIZE TE ST) 500 MG/24HRS=MILD. EYE RABBIT(STANDARD DRAIZE TEST) 20 MG/24HRS= MODERATE. MUTATION DATA:SISTER CHROMATID EXCHANGE IN HUMAN LYMPHOCYTES @10 MMOL/L; DNA DAMAGE IN MAMMALIAN LYMPHOCYRES @1 MMOL/L. REPRODUCTIVE EFFECTS: ORAL RAT TDL0 (FEMALE)= 1260 MG/KG (FETOTOXICITY, MUSCULOSKELETAL ABNORMALITIES); ORAL MOUSE TDL0 (MALE)= 2177 MG/KG (REDUCED WEIGHT GAIN IN NEWBORNS, BIOCHEM & METABOLIC EFFECTS IN NEWBORN).

========== Ecological Information ========== TOP

Ecological: NO SPECIFIC ECOLOGICAL DATA AVAILABLE FOR THIS PRODUCT.

========== MSDS Transport Information TOP

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Transport Information: PSN: CHLOROFORM, 6.1, UN1888, III.

========== Regulatory Information ==========

TOP

Sara Title III Information: SARA SECTION 302 (40CFR355.30): ESH TPQ=10,000 LBS. SARA SECTION 304 (40CFR302.40):CERCLA RQ= 10 LBS. SARA SECTION 313 (40CFR372.65): THIS CHEMICAL IS SUBJECT TO THE REPORTING REQUIREMENTS OF SEC 313. RCRA: CONTAINS RCRA REGULATED SUBSTANCE. EPA WASTE ID# D022, U044. SARA HAZARD CATEGORIES, SARA SECTIONS 311/312 (40CFR370.21): ACUTE: YES., CHRONIC: YES

Federal Regulatory Information: OSHA: THIS PRODUCT MEETS THE CRITERIA FOR A HAZARDOUS SUBSTANCE AS DEFINED IN THE HAZARD COMMUNICATION STANDARD 29 CFR 1910.1200. US INVENTORY STATUS: TSCA LISTED: YES. (TSCA CAS #67−66−3).

State Regulatory Information: CALIFORNIA PROPOSITION 65 − THIS PRODUCT CONTAINS CHEMICAL (CHLOROFORM) KNOWN TO THE STATE OF CALIFORNIA TO CAUSE CANCER.

========== Other Information ==========

TOP

Other Information: ONLY PERSONS PROPERLY QUALIFIED TO RESPOND TO AN EMERGENCY INVOLVING HAZARDOUS SUBSTANCES MAY RESPOND TO A SPILL ACCORDING TO FEDERAL REGULATIONS (OSHA 29 CFR 1910.120(A)(V).

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Material Safety Data Sheet

Version 3.2
Revision Date 04/05/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Chlorobenzene
Product Number	:	08650
Brand	:	Fluka
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Harmful by ingestion., Carcinogen

Target Organs

Liver, Kidney, Central nervous system, Thymus., Spleen., Bone marrow, Lungs, Testes.

GHS Classification
Flammable liquids (Category 3)
Acute toxicity, Inhalation (Category 4)
Acute toxicity, Oral (Category 4)
Acute aquatic toxicity (Category 2)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram

Signal word: Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H302 + H332	Harmful if swallowed or if inhaled.
H401	Toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s): none

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	0

NFPA Rating

Health hazard: 2
Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin Harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C_6H_5Cl
Molecular Weight : 112.56 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Chlorobenzene			
108-90-7	203-628-5	602-033-00-1	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Chlorobenzene	108-90-7	TWA	10 ppm	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.			
		TWA	75 ppm 350 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	75 ppm 350 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.			
	See Appendix D - Substances with No Established RELs			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -45 °C (-49 °F) - lit.
Boiling point	132 °C (270 °F) - lit.
Flash point	27.0 °C (80.6 °F) - closed cup
Ignition temperature	637 °C (1,179 °F)
Autoignition temperature	637.0 °C (1,178.6 °F)
Lower explosion limit	1.3 %(V)
Upper explosion limit	7.1 %(V)
Vapour pressure	15.7 hPa (11.8 mmHg) at 25.0 °C (77.0 °F)
Density	1.106 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 2.89 log Pow: 5
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 1,110 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity). Behavioral:Tremor. Behavioral:Ataxia.

Inhalation LC50
LC50 Inhalation - rat - 2965 ppm

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	Harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure

Incoordination., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: CZ0175000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC100 - Leuciscus idus (Golden orfe) - 0.03 - 28 mg/l - 48.0 h
	LC50 - Cyprinodon variegatus (sheepshead minnow) - 10 mg/l - 96.0 h
	LC50 - Lepomis macrochirus (Bluegill) - 4.5 - 7.4 mg/l - 76.0 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 6.2 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 4.30 - 16.00 mg/l - 24 h
	EC50 - No information available. - 7.60 mg/l - 24 h
	NOEC - Daphnia magna (Water flea) - < 1.4 mg/l - 11 d
	LC50 - Daphnia magna (Water flea) - 10.7 mg/l - 48 h
Toxicity to algae	EC50 - No information available. - 235.00 mg/l - 48 h
	EC50 - Pseudokirchneriella subcapitata (green algae) - 12.50 mg/l - 96 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d Bioconcentration factor (BCF): 75

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

Toxic to aquatic life.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 1134 Class: 3 Packing group: III
Proper shipping name: Chlorobenzene
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No

Poison Inhalation Hazard: No

IMDG
UN number: 1134 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: CHLOROBENZENE
Marine pollutant: No

IATA
UN number: 1134 Class: 3 Packing group: III
Proper shipping name: Chlorobenzene

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Harmful by ingestion., Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Chlorobenzene	108-90-7	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Chlorobenzene	108-90-7	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chlorobenzene	108-90-7	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chlorobenzene	108-90-7	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 07/30/2010
Print Date 10/26/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	α-Chlordane
Product Number	:	442449
Brand	:	Supelco
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Toxic by inhalation., Toxic by ingestion, Toxic by skin absorption, Irritant

GHS Label elements, including precautionary statements

Pictogram

Signal word: Danger

Hazard statement(s)

H302 + H332	Harmful if swallowed or if inhaled.
H311	Toxic in contact with skin.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.

HMIS Classification

Health hazard:	2
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	Toxic if inhaled. Causes respiratory tract irritation.
Skin	Toxic if absorbed through skin. Causes skin irritation.

Eyes	Causes eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Molecular Weight : 208.29 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Chlordane			
5103-71-9	225-825-5	-	-

4. FIRST AID MEASURES

General advice
Move out of dangerous area.Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	colourless

Safety data

pH	no data available
Melting point	93.0 - 94.0 °C (199.4 - 201.2 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 500.0 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	Toxic if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	Toxic if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Additional Information

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 0.0074 mg/l - 96 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus (Bluegill) - 24 h Bioconcentration factor (BCF): 322

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Chlordane)
Marine pollutant: Marine pollutant
Poison Inhalation Hazard: No

IMDG
UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Chlordane)
Marine pollutant: Marine pollutant

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Chlordane)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Toxic by inhalation., Toxic by ingestion, Toxic by skin absorption, Irritant

DSL Status
This product contains the following components that are not on the Canadian DSL nor NDSL lists.

	CAS-No.
Chlordane	5103-71-9

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components
No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Chlordane	5103-71-9	

New Jersey Right To Know Components

	CAS-No.	Revision Date
Chlordane	5103-71-9	

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Carbon Tetrachloride

1 . Product and company identification

Product name	:	Carbon Tetrachloride
Product code	:	M02224
Supplier	:	EMD Chemicals Inc. 480 S. Democrat Rd. Gibbstown, NJ 08027 856-423-6300 Technical Service Monday-Friday: 8:00 -5:00 PM
Synonym	:	Tetrachloromethane
Material uses	:	Other non-specified industry: Analytical reagent.
Validation date	:	8/4/2009.
In case of emergency	:	800-424-9300 CHEMTREC (USA) 613-996-6666 CANUTEC (Canada) 24 Hours/Day: 7 Days/Week

2 . Hazards identification

Emergency overview :

DANGER!

MAY BE FATAL IF INHALED, ABSORBED THROUGH SKIN OR SWALLOWED.
CAUSES RESPIRATORY TRACT, EYE AND SKIN IRRITATION.
CAUSES DAMAGE TO THE FOLLOWING ORGANS: EYE, LENS OR CORNEA.
SUSPECT CANCER HAZARD - MAY CAUSE CANCER.
MAY CAUSE DAMAGE TO THE FOLLOWING ORGANS: KIDNEYS, LUNGS, LIVER, SKIN, EYES, CENTRAL NERVOUS SYSTEM.
ASPIRATION HAZARD.
Warning: Contains Carbon Tetrachloride, a substance which harms public and environment by destroying ozone in the upper atmosphere.

WARNING: This product contains a chemical known to the State of California to cause cancer.

Do not breathe vapor or mist. Do not ingest. Do not get in eyes or on skin or clothing. Use only with adequate ventilation. Keep container tightly closed and sealed until ready for use. Wash thoroughly after handling.

Physical state	:	Liquid. [Colorless.]
OSHA/HCS status	:	This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Routes of entry	:	Dermal contact. Eye contact. Inhalation. Ingestion.

Potential acute health effects

Inhalation	:	Very toxic by inhalation. Irritating to respiratory system. Exposure to decomposition products may cause a health hazard. Serious effects may be delayed following exposure.
Ingestion	:	Very toxic if swallowed.
Skin	:	Very toxic in contact with skin. Irritating to skin.
Eyes	:	Irritating to eyes.

Potential chronic health effects

Carcinogenicity	:	May cause cancer. Risk of cancer depends on duration and level of exposure.
Mutagenicity	:	No known significant effects or critical hazards.
Teratogenicity	:	No known significant effects or critical hazards.
Developmental effects	:	No known significant effects or critical hazards.
Fertility effects	:	No known significant effects or critical hazards.
Target organs	:	Causes damage to the following organs: eye, lens or cornea. May cause damage to the following organs: kidneys, lungs, liver, skin, eyes, central nervous system (CNS).

Continued on next page

2 . Hazards identification

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

3 . Composition/information on ingredients

Name	CAS number	% by weight
Carbon Tetrachloride	56-23-5	100

4 . First aid measures

Eye contact : Call medical doctor or poison control center immediately. Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : Call medical doctor or poison control center immediately. In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Inhalation : Call medical doctor or poison control center immediately. Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : Call medical doctor or poison control center immediately. Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

5 . Fire-fighting measures

Flammability of the product : In a fire or if heated, a pressure increase will occur and the container may burst.

Extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Not suitable : None known.

Special exposure hazards : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds
carbonyl halides

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6 . Accidental release measures

Personal precautions : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see section 8).

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods for cleaning up

Continued on next page

6 . Accidental release measures

Spill : Stop leak if without risk. Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see section 1 for emergency contact information and section 13 for waste disposal. Dilute with water and mop up if water-soluble or absorb with an inert dry material and place in an appropriate waste disposal container.

7 . Handling and storage

Handling : Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage : Store in accordance with local regulations. Store in original container, protected from direct sunlight. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage.

8 . Exposure controls/personal protection

Ingredient	Exposure limits
Carbon Tetrachloride	**ACGIH (United States, 1996). Absorbed through skin.** TWA: 31 mg/m³ STEL: 63 mg/m³ **OSHA (United States, 1989).** TWA: 12.6 mg/m³ STEL: 6543210.0123456 mg/m³ **ACGIH TLV (United States, 1/2009). Absorbed through skin.** TWA: 5 ppm 8 hour(s). TWA: 31 mg/m³ 8 hour(s). STEL: 10 ppm 15 minute(s). STEL: 63 mg/m³ 15 minute(s). **OSHA PEL 1989 (United States, 3/1989).** TWA: 2 ppm 8 hour(s). TWA: 12.6 mg/m³ 8 hour(s). **OSHA PEL Z2 (United States, 11/2006).** TWA: 10 ppm 8 hour(s). CEIL: 25 ppm AMP: 200 ppm 5 minute(s). **NIOSH REL (United States, 6/2008).** STEL: 2 ppm 60 minute(s). STEL: 12.6 mg/m³ 60 minute(s).

Consult local authorities for acceptable exposure limits.

Engineering measures : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal protection

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Continued on next page

8 . Exposure controls/personal protection

Hands	:	Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Recommended: nitrile rubber
Eyes	:	Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. Recommended: splash goggles
Skin	:	Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. Recommended: lab coat
Environmental exposure controls	:	Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9 . Physical and chemical properties

Physical state	:	Liquid. [Colorless.]
Color	:	Colorless.
Odor	:	Ethereal.
Molecular weight	:	153.81 g/mole
Molecular formula	:	C-Cl4
pH	:	Not available.
Boiling/condensation point	:	76.7°C (170.1°F)
Melting/freezing point	:	-22.8°C (-9°F)
Critical temperature	:	282.9°C (541.2°F)
Relative density	:	1.59
Vapor pressure	:	12.1 kPa (91 mm Hg)
Vapor density	:	5.3 [Air = 1]
Volatility	:	99% (v/v)
Odor threshold	:	>10 ppm
Evaporation rate	:	7.52 compared with(n-BUTYL ACETATE=1)
VOC	:	99 (%)
Solubility	:	Very slightly soluble in the following materials: water

10 . Stability and reactivity

Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.
Materials to avoid	:	Slightly reactive or incompatible with the following materials: oxidizing materials and alkalis.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Continued on next page

11 . Toxicological information

Acute toxicity

Product/ingredient name	Test Route	Species	Result
Carbon Tetrachloride	LD Intraperitoneal	Rat	0.1 mL/kg
	LD50 Dermal	Rabbit	>20 g/kg
	LD50 Intraperitoneal	Rat	1500 uL/kg
	LD50 Oral	Rat	2350 mg/kg
	LD50 Oral	Rabbit	5760 mg/kg
	LD50 Oral	Guinea pig	5760 mg/kg
	LD50 Dermal	Rat	5070 mg/kg
	LDLo Intraperitoneal	Rat	3 mL/kg
	LDLo Intratracheal	Rat	90 mg/kg
	LDLo Oral	Man	429 mg/kg
	TDLo Intraperitoneal	Rat	2 mL/kg
	TDLo Intraperitoneal	Rat	1.5 mL/kg
	TDLo Intraperitoneal	Rat	300 mg/kg
	TDLo Intraperitoneal	Rat	120 mg/kg
	TDLo Intraperitoneal	Rat	0.25 mL/kg
	TDLo Intraperitoneal	Rat	26 uL/kg
	TDLo Intraperitoneal	Rat	0.2 mL/kg
	TDLo Intravenous	Rat	3200 mg/kg
	TDLo Oral	Rat	2.5 mg/kg
	TDLo Intraperitoneal	Rat	1 mL/kg
	TDLo Oral	Rat	1600 mg/kg
	TDLo Oral	Rat	0.3 mL/kg
	TDLo Oral	Rat	800 mg/kg
	TDLo Oral	Rat	0.25 mL/kg
	TDLo Oral	Rat	1 g/kg
	TDLo Oral	Rat	300 mg/kg
	TDLo Oral	Rat	0.66 mg/kg
	TDLo Oral	Rat	200 mg/kg
	TDLo Oral	Rat	1 mL/kg
	TDLo Oral	Rat	0.1 mL/kg
	TDLo Oral	Rat	8 mg/kg
	TDLo Oral	Rat	0.8 mL/kg
	TDLo Parenteral	Rat	1 mL/kg
	TDLo Subcutaneous	Rat	4000 mg/kg
	TDLo Intraperitoneal	Rat	3 mL/kg
	TDLo Unreported	Rat	1 mL/kg
	LC50 Inhalation Vapor	Rat	46000 mg/m3
	LC50 Inhalation Gas.	Rat	8000 ppm

Carcinogenicity

Classification

Product/ingredient name	ACGIH	IARC	EPA	NIOSH	NTP	OSHA
Carbon Tetrachloride	A2	2B	-	+	Possible	-

Continued on next page

11 . Toxicological information

May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity

No known significant effects or critical hazards.

Teratogenicity

No known significant effects or critical hazards.

12 . Ecological information

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
Carbon Tetrachloride	Acute LC50 125 mg/L	Fish	96 hours
	Acute LC50 43.3 mg/L Fresh water	Fish - Fathead minnow - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling) - 8 weeks - 12 to 16 mm	96 hours
	Acute LC50 42.9 mg/L Fresh water	Fish - Fathead minnow - Pimephales promelas - Juvenile (Fledgling, Hatchling, Weanling) - 8 weeks - 12 to 16 mm	96 hours
	Acute LC50 41.4 mg/L	Fish	96 hours
	Acute LC50 27 mg/L Fresh water	Fish - Bluegill - Lepomis macrochirus - Young of the year - 0.32 to 1.2 g	96 hours
	Acute LC50 24.3 mg/L	Fish	96 hours
	Acute LC50 4.8 ml/kg Marine water	Fish - English sole - Parophrys vetulus - 78.4 g	96 hours
	Acute LC50 41400 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - 30 days - 17.4 mm - 0.098 g	96 hours
	Acute LC50 35000 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <=24 hours	48 hours
	Acute LC50 27000 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus	96 hours
	Acute LC50 10400 ug/L Fresh water	Fish - Fathead minnow - Pimephales promelas - 30 days - 0.092 g	96 hours
	Acute LC50 150000 ug/L Marine water	Fish - Inland silverside - Menidia beryllina - 40 to 100 mm	96 hours
	Acute LC50 125000 ug/L Fresh water	Fish - Bluegill - Lepomis macrochirus - 33 to 75 mm	96 hours
	Chronic NOEC 7700 ug/L Fresh water	Daphnia - Water flea - Daphnia magna - <=24 hours	48 hours

Environmental effects : No known significant effects or critical hazards.

Other adverse effects : No known significant effects or critical hazards.

13 . Disposal considerations

The information presented only applies to the material as supplied. The identification based on characteristic(s) or listing may not apply if the material has been used or otherwise contaminated. It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste identification and disposal methods in compliance with applicable regulations. Disposal should be in accordance with applicable regional, national and local laws and regulations.

Continued on next page

14 . Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	-	Not available.	-	-		-

PG* : Packing group

15 . Regulatory information

United States

HCS Classification : Highly toxic material
Irritating material
Carcinogen
Target organ effects

U.S. Federal regulations : **United States inventory (TSCA 8b):** This material is listed or exempted.

TSCA (Toxic Substance Control Act): This product is listed on the TSCA Inventory.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: Carbon Tetrachloride
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: Carbon Tetrachloride : Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: Carbon Tetrachloride

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: No products were found.

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 313

	Product name	CAS number	Concentration
Form R - Reporting requirements :	Carbon Tetrachloride	56-23-5	100
Supplier notification :	Carbon Tetrachloride	56-23-5	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

Massachusetts Substances : This material is listed.

New Jersey Hazardous Substances : This material is listed.

New York Acutely Hazardous Substances : This material is listed.

Pennsylvania RTK Hazardous Substances : This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Carbon Tetrachloride	Yes.	No.	Yes.	No.

Canada

Continued on next page

15 . Regulatory information

WHMIS (Canada) : Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

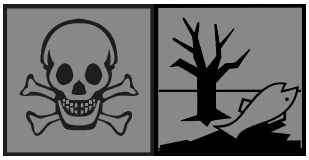
Canadian lists : **CEPA Toxic substances:** This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

CEPA DSL / CEPA NDSL : This material is listed or exempted.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all the information required by the Controlled Products Regulations.

EU regulations

Hazard symbol or symbols :



Risk phrases : R40- Limited evidence of a carcinogenic effect.
R23/24/25- Toxic by inhalation, in contact with skin and if swallowed.
R48/23- Toxic: danger of serious damage to health by prolonged exposure through inhalation.
R52/53- Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
R59- Dangerous for the ozone layer.

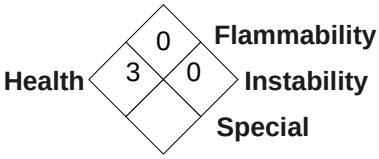
Safety phrases : S1/2- Keep locked up and out of the reach of children.
S23- Do not breathe [***].
S36/37- Wear suitable protective clothing and gloves.
S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
S59- Refer to manufacturer/supplier for information on recovery/recycling.
S61- Avoid release to the environment. Refer to special instructions/safety data sheet.

International regulations

International lists : **Australia inventory (AICS):** This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory (ENCS): This material is listed or exempted.
Japan inventory (ISHL): This material is listed or exempted.
Korea inventory (KECI): This material is listed or exempted.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.

16 . Other information

National Fire Protection Association (U.S.A.) :



Notice to reader

Continued on next page

16 . Other information

The statements contained herein are based upon technical data that EMD Chemicals Inc. believes to be reliable, are offered for information purposes only and as a guide to the appropriate precautionary and emergency handling of the material by a properly trained person having the necessary technical skills. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use, storage and disposal of these materials and the safety and health of employees and customers and the protection of the environment. EMD CHEMICALS INC. MAKES NO REPRESENTATION OR WARRANTY OF ANY KIND, EXPRESS OR IMPLIED, INCLUDING MERCHANTABILITY OR FITNESS FOR A PARTICULAR USE, WITH RESPECT TO THE INFORMATION HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.0
Revision Date 07/03/2009
Print Date 10/22/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Cadmium

Product Number : 20900
Brand : Fluka

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Cd
Molecular Weight : 112.41 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Cadmium			
7440-43-9	231-152-8	048-011-00-X	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Highly toxic by inhalation

HMIS Classification
Health Hazard: 4
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating
Health Hazard: 3
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be fatal if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation. May be fatal if absorbed through skin.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	not applicable
Ignition temperature	no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking.

Storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Cadmium	7440-43-9	TWA	0.002 mg/m3	1994-09-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Suspected human carcinogen: Human data are accepted as adequate in quality but are conflicting or insufficient to classify the agent as a confirmed human carcinogen; OR, the agent is carcinogenic in experimental animals at dose(s), by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. The A2 is used primatrily when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenitity in experimental animals with relevance to humans. Inhalable fraction. See Appendix C, paragraph A. Inhalable Particulate Mass TLVs (IPM-TLVs) for those materials that are hazardous when deposited anywhere in the respiratory tract. Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Substances for which the TLV is higher than the OSHA Permissible Exposure Limit (PEL) and/or the NIOSH Recommended Exposure Limit (REL). See CFR 58(124) :36338-33351, June 30, 1993, for revised OSHA PEL. Substance identified by other sources as a suspected or confirmed human carcinogen. Refers to Appendix A -- Carcinogens.				
		TWA	0.01 mg/m3	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen: Human data are accepted as adequate in quality but are conflicting or insufficient to classify the agent as a confirmed human carcinogen; OR, the agent is carcinogenic in experimental animals at dose(s), by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. The A2 is used primatrily when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenitity in experimental animals with relevance to humans.				
		TWA	0.002 mg/m3	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Suspected human carcinogen: Human data are accepted as adequate in quality but are conflicting or insufficient to classify the agent as a confirmed human carcinogen; OR, the agent is carcinogenic in experimental animals at dose(s), by route(s) of exposure, at site(s), of histologic type(s), or by mechanism(s) considered relevant to worker exposure. The A2 is used primatrily when there is limited evidence of carcinogenicity in humans and sufficient evidence of carcinogenitity in experimental animals with relevance to humans.				
		TWA	0.1 mg/m3	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.				
		CEIL	0.3 mg/m3	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium				

	standard, 1910.1027, is stayed or otherwise not in effect.				
	See 1910.1027. See Table Z-2 for the exposure limits for any operations or sectors where the exposure limits in 1910.1027 are stayed or are otherwise not in effect.				
		TWA	0.2 mg/m3	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.				
		CEIL	0.6 mg/m3	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.5-1970 This standard applies to any operations or sectors for which the Cadmium standard, 1910.1027, is stayed or otherwise not in effect.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	Rods
Colour	grey

Safety data

pH	no data available
Melting point	320.9 °C (609.6 °F)
Boiling point	765 °C (1,409 °F)
Flash point	not applicable

Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	1.29 hPa (0.97 mmHg) at 394 °C (741 °F)
Density	8.65 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Oxidizing agents, acids

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Cadmium/cadmium oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 2,330 mg/kg

LCLO Inhalation - Human - 20 h - 39 mg/m3
Remarks: Cardiac:Other changes. Vascular:Thrombosis distant from injection site. Respiratory disorder

LC50 Inhalation - rat - 30 h - 25 mg/m3
Remarks: Lungs, Thorax, or Respiration:Dyspnea.

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

IARC:	1 - Group 1: Carcinogenic to humans (Cadmium)
NTP:	Known to be human carcinogen (Cadmium)
	Known to be human carcinogenThe reference note has been added by Royal Haskoning based on the background information of the NTP. (Cadmium)
OSHA:	1910.1027 (Cadmium)

Signs and Symptoms of Exposure

Acute inhalation exposure to cadmium fumes may cause "metal fume fever" with flu-like symptoms of weakness, fever, headache, chills, nausea, vomiting, dizziness, sweating, muscular pain, cough and difficulty breathing. Acute pulmonary edema may develop within 24 hours and reaches a maximum by three days.The first chronic effect of exposure to cadmium is generally kidney damage, manifested by excretion of excessive protein in the urine, followed by anemia, teeth discoloration and loss of smell. Cadmium also is believed to cause pulmonary emphysema and bone disease.

Potential Health Effects

Inhalation	May be fatal if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation. May be fatal if absorbed through skin.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 72 d Bioconcentration factor (BCF): 55

Ecotoxicity effects

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 1.0 µg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	mortality NOEC - Daphnia - 0.019 mg/l - 24 h
	EC50 - Daphnia magna (Water flea) - 0.024 mg/l - 48 h
	mortality LOEC - Daphnia - 0.039 mg/l - 24 h
Toxicity to algae	Growth inhibition IC50 - Chaetoceros sp. - 0.028 mg/l - 48 h

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Highly toxic by inhalation

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	1993-04-24

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Cadmium	7440-43-9	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm. Cadmium	7440-43-9	2007-09-28

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known in the State of California to cause cancer. Cadmium	7440-43-9	2007-09-28

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 01/01/2011
Print Date 02/14/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	*cis*-1,2-Dichloroethene
Product Number	:	48597
Brand	:	Supelco
Product Use	:	For laboratory research purposes.
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Manufacturer	:	Sigma-Aldrich Corporation 3050 Spruce St. St. Louis, Missouri 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid

Target Organs

Central nervous system, Liver, Kidney

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Inhalation (Category 4)
Acute aquatic toxicity (Category 3)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H332	Harmful if inhaled.
H402	Harmful to aquatic life.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

HMIS Classification

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	1

NFPA Rating

Health hazard: 2
Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : *cis*-Acetylene dichloride
cis-1,2-Dichloroethylene

Formula : $C_2H_2Cl_2$ $C_2H_2Cl_2$
Molecular Weight : 96.94 g/mol96.94 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
cis-Dichloroethylene			
156-59-2	205-859-7	602-026-00-3	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature: 2 - 8 °C

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	light yellow

Safety data

pH	no data available
Melting/freezing point	Melting point/range: -80 °C (-112 °F) - lit.
Boiling point	60 °C (140 °F) - lit.
Flash point	6.0 °C (42.8 °F) - closed cup

Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	1.284 g/cm3 at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
Inhalation LC50
LC50 Inhalation - rat - 13700 ppm
Remarks: Behavioral:Somnolence (general depressed activity). Liver:Fatty liver degeneration.

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
narcosis, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: KV9420000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: 1,2-DICHLOROETHYLENE
Marine pollutant: No

IATA
UN-Number: 1150 Class: 3 Packing group: II
Proper shipping name: 1,2-Dichloroethylene

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid

DSL Status
This product contains the following components listed on the Canadian NDSL list. All other components are on the Canadian DSL list.

	CAS-No.
cis-Dichloroethylene	156-59-2

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/22/2006
Date Updated: 01/29/2006
Version 1.4

Section 1 - Product and Company Information

Product Name	BETA-BHC, 50MG, NEAT
Product Number	48494
Brand	SUPELCO
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
B-BENZENE HEXACHLORIDE	319-85-7	No

Formula	C6H6Cl6
Synonyms	trans-alpha-Benzenehexachloride * beta-BHC * Cyclohexane, beta-1,2,3,4,5,6-hexachloro- * Cyclohexane, 1,2,3,4,5,6-hexachloro-, beta- * Cyclohexane, 1,2,3,4,5,6-hexachloro-, trans- * ENT 9,233 * beta-HCH * beta-Hexachlorobenzene * 1-alpha,2-beta,3-alpha,4-beta,5-alpha,6-beta-Hexachlorocyclohexane * beta-Hexachlorocyclohexane * beta-1,2,3,4,5,6-Hexachlorocyclohexane * beta-Lindane
RTECS Number:	GV4375000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
Possible Carcinogen (US). Target organ(s): Liver. Kidneys.

HMIS RATING
- HEALTH: 2*
- FLAMMABILITY: 0
- REACTIVITY: 0

NFPA RATING
- HEALTH: 2
- FLAMMABILITY: 0
- REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Sweep up, place in a bag and hold for waste disposal. Avoid raising dust. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe dust. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Solid Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	290.8 AMU	
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	> 300 °C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 3.78	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	
Refractive Index	N/A	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	Solubility in Water:Insoluble.	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.
Materials to Avoid: Strong oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Hydrogen chloride gas, Nitrogen oxides, Phosgene gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: Harmful if absorbed through skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Blood. Kidneys. Liver. Central nervous system.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
6000 mg/kg
LD50

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Species: Mouse
Route of Application: Oral
Dose: 18 GM/KG
Exposure Time: 2Y
Frequency: C
Result: Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Liver:Tumors.

IARC CARCINOGEN LIST
Rating: Group 2B Group 2B

NTP CARCINOGEN LIST

Rating: Anticipated to be a carcinogen.

IRIS/EPA CARCINOGEN LIST
Rating: Group C

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 672 MG/KG/
Route of Application: Oral

Exposure Time: (2W MALE)
Result: Paternal Effects: Testes, epididymis, sperm duct.

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Species: Poecilia reticulata
Time: 96 h
Value: 1.6 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s.
UN#: 3077
Class: 9
Packing Group: Packing Group III
Hazard Label: Class 9
PIH: Not PIH

IATA
Proper Shipping Name: Environmentally hazardous substance, solid, n.o.s
IATA UN Number: 3077
Hazard Class: 9
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T-N
Indication of Danger: Toxic. Dangerous for the environment.
R: 21-25-40-50/53
Risk Statements: Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 22-36/37-45-60-61
Safety Statements: Do not breathe dust. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: Harmful in contact with skin. Toxic if swallowed. Limited evidence of a carcinogenic effect. Very toxic to aquatic organisms, may cause long-term adverse effects in the

aquatic environment.
Safety Statements: Do not breathe dust. Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). This material and its container must be disposed of as hazardous waste. Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Possible Carcinogen (US). Target organ(s): Liver. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: Yes

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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Material Safety Data Sheet

Version 4.0
Revision Date 07/25/2010
Print Date 10/16/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Beryllium
Product Number	:	378135
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+18003255832
Fax	:	+18003255052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen, Highly toxic by inhalation, Toxic by ingestion, Skin sensitiser, Irritant

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H301	Toxic if swallowed.
H315	Causes skin irritation.
H317	May cause an allergic skin reaction.
H319	Causes serious eye irritation.
H330	Fatal if inhaled.
H335	May cause respiratory irritation.
H350	May cause cancer.

Precautionary statement(s)

P201	Obtain special instructions before use.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P280	Wear protective gloves.
P284	Wear respiratory protection.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/ physician.

HMIS Classification

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	3
Fire:	0
Reactivity Hazard:	3

Potential Health Effects

Inhalation	May be fatal if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Be
Molecular Weight : 9.01 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
BERYLLIUM FOIL			
7440-41-7	231-150-7	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
BERYLLIUM FOIL	7440-41-7	TWA	2 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z2
Remarks	(Z37.29-1970)				
		CEIL	5 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z2
	(Z37.29-1970)				
		Peak	25 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z2
	(Z37.29-1970)				
		TWA	0.002 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	This value is from Table Z-2, 29 CFR 1910.1000				
		CEIL	0.005 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	This value is from Table Z-2, 29 CFR 1910.1000				
		Peak	0.025 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	This value is from Table Z-2, 29 CFR 1910.1000				
		TWA	0.002 mg/m3	1997-05-21	USA. ACGIH Threshold Limit Values (TLV)
	Confirmed human carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies.				
		STEL	0.01 mg/m3	1997-05-21	USA. ACGIH Threshold Limit Values (TLV)
	Confirmed human carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies.				
		TWA	2microgram per cubic meter	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z27.29-1970				
		CEIL	5microgram per cubic meter	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z27.29-1970				
		Peak	25microgram per cubic meter	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z27.29-1970				
		TWA	0.00005 mg/m3	2009-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Beryllium sens Chronic beryllium disease (berylliosis) Confirmed human carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies. Danger of cutaneous absorption Sensitizer				

Personal protective equipment

Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder

Safety data

pH	no data available
Melting point	1,278 °C (2,332 °F) - lit.
Boiling point	2,970 °C (5,378 °F) - lit.
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1.85 g/cm3 at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Alkali metals

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.
Hazardous decomposition products formed under fire conditions. - Nature of decomposition products not known.

11. TOXICOLOGICAL INFORMATION

Acute toxicity
Inhalation: Irritating to respiratory system.

Inhalation: Irritating to respiratory system.

Inhalation: Irritating to respiratory system.

LD50 Intravenous - rat - 0.496 mg/kg
Remarks: Liver:Hepatitis (hepatocellular necrosis), zonal.

LD50 Intratracheal - rat - 51 mg/kg

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
May cause allergic skin reaction.

Germ cell mutagenicity

Genotoxicity in vitro - Human - HeLa cell
DNA damage

Genotoxicity in vitro - mouse - Ascites tumor
DNA damage

Carcinogenicity

Carcinogenicity - rat - Intratracheal
Tumorigenic:Neoplastic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Lungs, Thorax, or Respiration:Bronchiogenic carcinoma.

Carcinogenicity - rabbit - Intravenous
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Musculoskeletal:Tumors.

Possible human carcinogen

IARC:	1 - Group 1: Carcinogenic to humans (BERYLLIUM FOIL)
NTP:	Known to be human carcinogen (BERYLLIUM FOIL)
	Known to be human carcinogenThe reference note has been added by TD based on the background information of the NTP. (BERYLLIUM FOIL)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.
May cause respiratory irritation.
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be fatal if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Additional Information
RTECS: DS1750000

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium, powder
Reportable Quantity (RQ): 10 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1567 Class: 6.1 (4.1) Packing group: II EMS-No: F-G, S-G
Proper shipping name: BERYLLIUM POWDER
Marine pollutant: No

IATA
UN-Number: 1567 Class: 6.1 (4.1) Packing group: II
Proper shipping name: Beryllium powder

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen, Highly toxic by inhalation, Toxic by ingestion, Skin sensitiser, Irritant

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
BERYLLIUM FOIL	7440-41-7	1993-04-24

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
BERYLLIUM FOIL	7440-41-7	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
BERYLLIUM FOIL	7440-41-7	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
BERYLLIUM FOIL	7440-41-7	1993-04-24

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. BERYLLIUM FOIL	7440-41-7	2008-10-10

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Back

Chem Service Inc.
Material Safety Data Sheet
Date: Monday, March 21, 2005
Last Revised Date: 5/5/03

SECTION 1 - CHEMICAL PRODUCT and COMPANY IDENTIFICATION

Catalog Number: PS-71
Description: Lindane
Other Name(s): 1.2.3.4.5.6-Hexachlorocyclohexane-gamma isomer

Supplied by CHEM SERVICE, Inc. PO BOX 599, WEST CHESTER, PA 19381 (610)-692-3026
EMERGENCY PHONE: 1-610-692-3026

SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS

CAS No.: 58-89-9
Description: Lindane
EINECS No.: 200-401-2
Hazard Symbols: T;N

SECTION 3 - HAZARDS IDENTIFICATION

Contact lenses should not be worn in the laboratory.All chemicals should be considered hazardous - Avoid direct physical contact!
Suspected Carcinogen-may produce cancer. May be fatal if inhaled! May be fatal or cause blindness if swallowed. May be fatal if swallowed! Exposure can cause nausea, headache dizziness and/or vomiting. Aplastic anemia may be related to this compound. Can cause eye irritation. Can cause skin irritation. May be fatal if absorbed through the skin! Can cause cyanosis. Can cause blood disorders. Can cause cardiovascular system injury. Can cause sensitization by skin contact. Exposure can cause liver damage. Can cause nervous system injury. Vapors and/or direct eye contact can cause severe eye burns. Exposure can cause kidney damage.

SECTION 4 - FIRST AID MEASURES

An antidote is a substance intended to counteract the effect of a poison. It should be administered only by a physician or trained emergency personnel. Medical advice can be obtained from a POISON CONTROL CENTER.
In case of contact: Flush eyes continuously with water for 15-20 minutes. Flush skin with water for 15-20 minutes. If no burns have occurred-use soap and water to cleanse skin. If inhaled remove patient to fresh air. Administer oxygen if patient is having difficulty breathing. If patient has stopped breathing administer artificial respirations. If patient is in cardiac arrest administer CPR. Continue life supporting measures until medical assistance has arrived. Remove and wash contaminated clothing. If patient is exhibiting signs of shock - Keep warm and quiet. Contact Poison Control Center immediately if necessary. Induce vomiting if swallowed. Do not administer liquids or induce vomiting to an unconscious or convulsing person. If patient is vomiting-watch closely to make sure airway does not become obstructed by vomit. Get medical attention if necessary. ANTIDOTE: A short acting barbituate for central nervouse system symptoms; Diazepam for convulsions; If ingested induce emesis administer Magnesium Sulfateand observe.

SECTION 5 - FIRE AND EXPLOSION DATA

Flash Point: Not Available
Extinguishing Media: Carbon dioxide, dry chemical powder or spray.
Upper Explosion Limit: Not Available
Lower Explosion Limit: Not Available
Autoignition Temperature: Not Available
NFPA Hazard Rating: Not Available

SECTION 6 - ACCIDENTAL RELEASE MEASURES

Spills or leaks: Evacuate area. Wear appropriate OSHA regulated equipment. Ventilate area. Sweep up and place in an appropriate container. Hold for disposal.

Wash contaminated surfaces to remove any residues. Remove contaminated clothing and wash before reuse.

SECTION 7 - HANDLING AND STORAGE

Handling:
This chemical should be handled only in a hood. Eye shields should be worn.
Use appropriate OSHA/MSHA approved safety equipment.
Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation
Wash thoroughly after handling.

Storage:
Store in a cool dry place. Store only with compatible chemicals.
Keep tightly closed.

SECTION 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION
OSHA PEL (TWA): 0.5 mg/m3
ACGIH TLV (TWA): 0.5mg/m3 skin
ACGIH TLV (STEL): Not Available

Personal Protective Equipment
Eyes: Wear Safety Glasses.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to minimize contact with skin.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 requirements must be followed whenever workplace conditions warrant a respirator's use.

SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES

Color: White
Phase: Crystalline solid
Melting Point: 112.5 C
Boiling Point: 323 C
Specific Gravity: 10.06
Vapor Density: 0.00001mm @20
Vapor Preasure: Not Available
Solubility in Water: Insoluble (immiscible)
Odor: Pungent, acrid
Evaporation Rate (Butyl acetate=1): Not Available
Molecular Weight: 290.82
Molecular Formula: C6H6Cl6

SECTION 10 - STABILITY AND REACTIVITY

Incompatible with strong bases. Incompatible with strong oxidizing agents.

SECTION 11 - TOXICOLOGY INFORMATION

RTECS: GV4900000
Oral Rat or Mouse LD50: 76mg/kg
Dermal Rat or Mouse LD50: 414mg/kg
Rat or Mouse LC50 : Not Available

Carcinogenicity
- OSHA: No
- IARC: No
- NTP: Yes
- ACGIH: No
- NIOSH: No
- Other: Yes

SECTION 12 - ECOLOGICAL INFORMATION

Ecotoxicity: Not Available
Environmental Fate: Not Available

SECTION 13 - DISPOSAL CONSIDERATIONS

DISPOSAL: Burn in a chemicals incinerator equipped with an afterburner and scrubber.

SECTION 14 - TRANSPORTATION INFORMATION

UN Number: UN2811
Class: 6.1
Packing Group: III
Proper Shipping Name: Toxic solids, organic, nos

SECTION 15 - REGULATORY INFORMATION

European Labeling in Accordance with EC Directives
Hazard Symbols: T;N

Risk Phrases:
R23/24/25: Toxic by inhalation, in contact with skin, and if swallowed.
R36/38: Irritating to eyes and skin.
R50/53: Very toxic to aquatic organisms and May cause long-term adverse effects in the aquatic environment.

Safety Phrase:
S13: Keep away from food, drink and animal feeding stuffs.
S45: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).
S60: This material and/or it's container must be disposed of as hazardous waste.
S61: Avoid release to the environment. Refer to special instructions/Safety data sheet.

SECTION 16 - OTHER INFORMATION

The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded MSDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Material Safety Data Sheet (MSDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an MSDS for a solution or mixture the user should refer to the MSDS for every component of the solution or mixture. Chem Service warrants that this MSDS is based upon the most current information available to Chem Service at the time it

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This product is furnished FOR LABORATORY USE ONLY!

MATERIAL SAFETY DATA SHEET

SECTION 1 PRODUCT AND COMPANY IDENTIFICATION

PRODUCT

Product Name: **MIXED XYLENES**
Product Description: Aromatic Hydrocarbon

Intended Use: Chemical intermediate, Solvent

COMPANY IDENTIFICATION

Supplier: **EXXONMOBIL CHEMICAL COMPANY**
P.O. BOX 3272
HOUSTON, TX. 77253-3272 USA

24 Hour Health Emergency	(800) 726-2015
Transportation Emergency Phone	(800) 424-9300 or (703) 527-3887 CHEMTREC
Product Technical Information	(281) 870-6000/Health & Medical (281) 870-6884
Supplier General Contact	(281) 870-6000

SECTION 2 COMPOSITION / INFORMATION ON INGREDIENTS

Reportable Hazardous Substance(s) or Complex Substance(s)

Name	CAS#	Concentration*
Mixed Xylenes	1330-20-7	100 %

Hazardous Constituent(s) Contained in Complex Substance(s)

Name	CAS#	Concentration*
ETHYL BENZENE	100-41-4	10 - 20%

* All concentrations are percent by weight unless material is a gas. Gas concentrations are in percent by volume.

SECTION 3 HAZARDS IDENTIFICATION

This material is considered to be hazardous according to regulatory guidelines (see (M)SDS Section 15).

POTENTIAL PHYSICAL / CHEMICAL EFFECTS

Material can release vapors that readily form flammable mixtures. Vapor accumulation could flash and/or explode if ignited. Material can accumulate static charges which may cause an ignition.

POTENTIAL HEALTH EFFECTS

Irritating to eyes. Possible human cancer hazard. If swallowed, may be aspirated and cause lung damage. May be irritating to the eyes, nose, throat, and lungs.

Target Organs: Eye |

NFPA Hazard ID:	Health:	2	Flammability:	3	Reactivity:	0
HMIS Hazard ID:	Health:	2*	Flammability:	3	Reactivity:	0

NOTE: This material should not be used for any other purpose than the intended use in Section 1 without expert advice. Health studies have shown that chemical exposure may cause potential human health risks which may vary from person to person.

SECTION 4 FIRST AID MEASURES

INHALATION

Remove from further exposure. For those providing assistance, avoid exposure to yourself or others. Use adequate respiratory protection. If respiratory irritation, dizziness, nausea, or unconsciousness occurs, seek immediate medical assistance. If breathing has stopped, assist ventilation with a mechanical device or use mouth-to-mouth resuscitation.

SKIN CONTACT

Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

EYE CONTACT

Flush thoroughly with water for at least 15 minutes. Get medical assistance.

INGESTION

Seek immediate medical attention. Do not induce vomiting.

NOTE TO PHYSICIAN

If ingested, material may be aspirated into the lungs and cause chemical pneumonitis. Treat appropriately. This light hydrocarbon material, or a component, may be associated with cardiac sensitization following very high exposures (well above occupational exposure limits) or with concurrent exposure to high stress levels or heart-stimulating substances like epinephrine. Administration of such substances should be avoided.

SECTION 5 FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

Appropriate Extinguishing Media: Use water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flames.

Inappropriate Extinguishing Media: Straight Streams of Water

FIRE FIGHTING

Fire Fighting Instructions: Flammable. Evacuate area. If a leak or spill has not ignited, use water spray to disperse the vapors and to protect personnel attempting to stop a leak. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply. Firefighters should use standard protective equipment and in enclosed spaces, self-contained breathing apparatus (SCBA). Use water spray to cool fire exposed surfaces and to protect personnel.

Unusual Fire Hazards: Hazardous material. Firefighters should consider protective equipment indicated in Section 8.

Hazardous Combustion Products: Smoke, Fume, Incomplete combustion products, Oxides of carbon

FLAMMABILITY PROPERTIES

Flash Point [Method]: >23C (73F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: 432°C (810°F) - 528°C (982°F) [Technical literature]

SECTION 6 ACCIDENTAL RELEASE MEASURES

NOTIFICATION PROCEDURES

In the event of a spill or accidental release, notify relevant authorities in accordance with all applicable regulations. US regulations require reporting releases of this material to the environment which exceed the applicable reportable quantity or oil spills which could reach any waterway including intermittent dry creeks. The National Response Center can be reached at (800)424-8802.

PROTECTIVE MEASURES

Avoid contact with spilled material. Warn or evacuate occupants in surrounding and downwind areas if required due to toxicity or flammability of the material. See Section 5 for fire fighting information. See the Hazard Identification Section for Significant Hazards. See Section 4 for First Aid Advice. See Section 8 for advice on the minimum requirements for personal protective equipment. Additional protective measures may be necessary, depending on the specific circumstances and/or the expert judgment of the emergency responders.

SPILL MANAGEMENT

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. All equipment used when handling the product must be grounded. Do not touch or walk through spilled material. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Use clean non-sparking tools to collect absorbed material. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Large Spills: Water spray may reduce vapor; but may not prevent ignition in closed spaces. Recover by pumping or with suitable absorbent.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

Water spill and land spill recommendations are based on the most likely spill scenario for this material; however, geographic conditions, wind, temperature, (and in the case of a water spill) wave and current direction and speed may greatly influence the appropriate action to be taken. For this reason, local experts should be consulted. Note: Local regulations may prescribe or limit action to be taken.

ENVIRONMENTAL PRECAUTIONS

Large Spills: Dike far ahead of liquid spill for later recovery and disposal. Prevent entry into waterways, sewers, basements or confined areas.

SECTION 7 HANDLING AND STORAGE

HANDLING

Avoid contact with skin. Avoid contact with eyes. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Prevent small spills and leakage to avoid slip hazard. Material can accumulate static charges which may cause an electrical spark (ignition source). Use proper bonding

and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation. Consult local applicable standards for guidance. Additional references include American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practice on Static Electricity) or CENELEC CLC/TR 50404 (Electrostatics - Code of practice for the avoidance of hazards due to static electricity).

Loading/Unloading Temperature: [Ambient]

Transport Temperature: [Ambient]
Transport Pressure: [Ambient]

Static Accumulator: This material is a static accumulator. A liquid is typically considered a nonconductive, static accumulator if its conductivity is below 100 pS/m (100x10E-12 Siemens per meter) and is considered a semiconductive, static accumulator if its conductivity is below 10,000 pS/m. Whether a liquid is nonconductive or semiconductive, the precautions are the same. A number of factors, for example liquid temperature, presence of contaminants, anti-static additives and filtration can greatly influence the conductivity of a liquid.

STORAGE

Ample fire water supply should be available. A fixed sprinkler/deluge system is recommended. The container choice, for example storage vessel, may effect static accumulation and dissipation. Keep container closed. Handle containers with care. Open slowly in order to control possible pressure release. Store in a cool, well-ventilated area. Outside or detached storage preferred. Storage containers should be grounded and bonded. Fixed storage containers, transfer containers and associated equipment should be grounded and bonded to prevent accumulation of static charge.
Storage Temperature: [Ambient]
Storage Pressure: [Ambient]

Suitable Containers/Packing: Tankers; Drums; Tank Trucks; Barges; Tank Cars
Suitable Materials and Coatings (Chemical Compatibility): Carbon Steel; Polyester; Stainless Steel; Teflon
Unsuitable Materials and Coatings: Natural Rubber; Butyl Rubber; Ethylene-proplyene-diene monomer (EPDM); Polystyrene; Polyethylene; Polypropylene; PVC; Polyvinyl Alcohol; Polyacrylonitrile; Compatibility with plastics will vary

SECTION 8 EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE LIMIT VALUES

Exposure limits/standards (Note: Exposure limits are not additive)

Source	Form	Limit / Standard			NOTE	Source
ETHYL BENZENE		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
ETHYL BENZENE		TWA	20 ppm		N/A	ACGIH
Mixed Xylenes		TWA	435 mg/m3	100 ppm	N/A	OSHA Z1
Mixed Xylenes		STEL	150 ppm		N/A	ACGIH
Mixed Xylenes		TWA	100 ppm		N/A	ACGIH
XYLENES	Vapor.	RCP - TWA	434 mg/m3	100 ppm	Total Hydrocarbons	ExxonMobil

NOTE: Limits/standards shown for guidance only. Follow applicable regulations.

ENGINEERING CONTROLS

The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Control measures to consider:

Adequate ventilation should be provided so that exposure limits are not exceeded. Use explosion-proof ventilation equipment.

PERSONAL PROTECTION

Personal protective equipment selections vary based on potential exposure conditions such as applications, handling practices, concentration and ventilation. Information on the selection of protective equipment for use with this material, as provided below, is based upon intended, normal usage.

Respiratory Protection: If engineering controls do not maintain airborne contaminant concentrations at a level which is adequate to protect worker health, an approved respirator may be appropriate. Respirator selection, use, and maintenance must be in accordance with regulatory requirements, if applicable. Types of respirators to be considered for this material include:

Half-face filter respirator

For high airborne concentrations, use an approved supplied-air respirator, operated in positive pressure mode. Supplied air respirators with an escape bottle may be appropriate when oxygen levels are inadequate, gas/vapor warning properties are poor, or if air purifying filter capacity/rating may be exceeded.

Hand Protection: Any specific glove information provided is based on published literature and glove manufacturer data. Glove suitability and breakthrough time will differ depending on the specific use conditions. Contact the glove manufacturer for specific advice on glove selection and breakthrough times for your use conditions. Inspect and replace worn or damaged gloves. The types of gloves to be considered for this material include:

Chemical resistant gloves are recommended.

Eye Protection: If contact is likely, safety glasses with side shields are recommended.

Skin and Body Protection: Any specific clothing information provided is based on published literature or manufacturer data. The types of clothing to be considered for this material include:

Chemical/oil resistant clothing is recommended.

Specific Hygiene Measures: Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants. Discard contaminated clothing and footwear that cannot be cleaned. Practice good housekeeping.

ENVIRONMENTAL CONTROLS

See Sections 6, 7, 12, 13.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

Note: Physical and chemical properties are provided for safety, health and environmental considerations only and may not fully represent product specifications. Contact the Supplier for additional information.

GENERAL INFORMATION

Physical State: Liquid
Form: Clear
Color: Colorless
Odor: Aromatic
Odor Threshold: N/D

IMPORTANT HEALTH, SAFETY, AND ENVIRONMENTAL INFORMATION

Relative Density (at 15 C): 0.869 [Technical literature]
Density (at 15 ºC): 870 kg/m³ (7.26 lbs/gal, 0.87 kg/dm³) [ISO 12185]
Flash Point [Method]: >23C (73F) [ASTM D-56]
Flammable Limits (Approximate volume % in air): LEL: 0.9 UEL: 7.0
Autoignition Temperature: 432°C (810°F) - 528°C (982°F) [Technical literature]
Boiling Point / Range: 136C (277F) - 145C (292F) [Technical literature]
Vapor Density (Air = 1): < 1 at 101 kPa [Technical literature]
Vapor Pressure: 0.8 kPa (6 mm Hg) at 20 C [Calculated]
Evaporation Rate (n-butyl acetate = 1): 0.85 [In-house method]
pH: N/D
Log Pow (n-Octanol/Water Partition Coefficient): 3.12 - 3.16 [Technical literature]
Solubility in Water: Negligible
Viscosity: [N/D at 40 °C] | 0.79 cSt (0.79 mm2/sec) at 20C [ASTM D7042]
Oxidizing Properties: See Hazards Identification Section.

OTHER INFORMATION

Freezing Point: -54°C (-65°F) [Technical literature]
Melting Point: -39°C (-39°F) [Technical literature]
Pour Point: -95°C (-139°F) - 13°C (56°F) [Technical literature]
Molecular Weight: 106 G/MOLE [Calculated]
Hygroscopic: No
Coefficient of Thermal Expansion: 0.00105 V/VDEGC [Calculated] [In-house method]
Decomposition Temperature: N/D

SECTION 10 STABILITY AND REACTIVITY

STABILITY: Material is stable under normal conditions.

CONDITIONS TO AVOID: Avoid heat, sparks, open flames and other ignition sources.

MATERIALS TO AVOID: Strong oxidizers

HAZARDOUS DECOMPOSITION PRODUCTS: Material does not decompose at ambient temperatures.

HAZARDOUS POLYMERIZATION: Will not occur.

SECTION 11 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY

Route of Exposure	Conclusion / Remarks
Inhalation	
Toxicity (Rat): LC50 > 20 mg/l	Minimally Toxic. Based on test data for the material.
Irritation: No end point data.	Elevated temperatures or mechanical action may form vapors, mist, or fumes which may be irritating to the eyes, nose, throat, or

	lungs.
Ingestion	
Toxicity (Rat): LD50 > 3523 mg/kg	Minimally Toxic. Based on test data for the material.
Skin	
Toxicity (Rabbit): LD50 > 4200 mg/kg	Minimally Toxic. Based on test data for the material.
Irritation: Data available.	Irritating to the skin. Based on test data for the material.
Eye	
Irritation: Data available.	Moderately irritating to the eyes. Based on test data for structurally similar materials.

CHRONIC/OTHER EFFECTS

For the product itself:

Vapor concentrations above recommended exposure levels are irritating to the eyes and the respiratory tract, may cause headaches and dizziness, are anesthetic and may have other central nervous system effects. Small amounts of liquid aspirated into the lungs during ingestion or from vomiting may cause chemical pneumonitis or pulmonary edema. Very high exposure (confined spaces / abuse) to light hydrocarbons may result in abnormal heart rhythm (arrhythmias). Concurrent high stress levels and/or co-exposure to high levels of hydrocarbons (above occupational exposure limits), and to heart-stimulating substances like epinephrine, nasal decongestants, asthma drugs, or cardiovascular drugs may initiate arrhythmias.

Contains:

ETHYLBENZENE: Caused cancer in laboratory animal studies. The relevance of these findings to humans is uncertain.

Additional information is available by request.

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	5

--REGULATORY LISTS SEARCHED--

1 = NTP CARC	3 = IARC 1	5 = IARC 2B
2 = NTP SUS	4 = IARC 2A	6 = OSHA CARC

SECTION 12 ECOLOGICAL INFORMATION

The information given is based on data available for the material, the components of the material, and similar materials.

ECOTOXICITY

Material -- Expected to be toxic to aquatic organisms.
Material -- Not expected to demonstrate chronic toxicity to aquatic organisms.

MOBILITY

Material -- Highly volatile, will partition rapidly to air. Not expected to partition to sediment and wastewater solids.

PERSISTENCE AND DEGRADABILITY

Biodegradation:
Material -- Expected to be readily biodegradable.
Hydrolysis:
Material -- Transformation due to hydrolysis not expected to be significant.
Photolysis:
Material -- Transformation due to photolysis not expected to be significant.
Atmospheric Oxidation:
Material -- Expected to degrade rapidly in air

BIOACCUMULATION POTENTIAL
Material -- Potential to bioaccumulate is low.

OTHER ECOLOGICAL INFORMATION
VOC (EPA Method 24): 7.252 lbs/gal

SECTION 13 DISPOSAL CONSIDERATIONS

Disposal recommendations based on material as supplied. Disposal must be in accordance with current applicable laws and regulations, and material characteristics at time of disposal.

DISPOSAL RECOMMENDATIONS
Product is suitable for burning in an enclosed controlled burner for fuel value or disposal by supervised incineration at very high temperatures to prevent formation of undesirable combustion products.

REGULATORY DISPOSAL INFORMATION
RCRA Information: Disposal of unused product may be subject to RCRA regulations (40 CFR 261). Disposal of the used product may also be regulated due to ignitability, corrosivity, reactivity or toxicity as determined by the Toxicity Characteristic Leaching Procedure (TCLP). Potential RCRA characteristics: IGNITABILITY.

Empty Container Warning Empty Container Warning (where applicable): Empty containers may contain residue and can be dangerous. Do not attempt to refill or clean containers without proper instructions. Empty drums should be completely drained and safely stored until appropriately reconditioned or disposed. Empty containers should be taken for recycling, recovery, or disposal through suitably qualified or licensed contractor and in accordance with governmental regulations. DO NOT PRESSURISE, CUT, WELD, BRAZE, SOLDER, DRILL, GRIND, OR EXPOSE SUCH CONTAINERS TO HEAT, FLAME, SPARKS, STATIC ELECTRICITY, OR OTHER SOURCES OF IGNITION. THEY MAY EXPLODE AND CAUSE INJURY OR DEATH.

SECTION 14 TRANSPORT INFORMATION

LAND (DOT)
Proper Shipping Name: FLAMMABLE LIQUIDS, N.O.S. (Xylenes, Ethylbenzene)
Hazard Class & Division: 3
ID Number: 1993
Packing Group: III
Product RQ: 100 LBS - Mixed Xylenes
ERG Number: 128
Label(s): 3
Transport Document Name: UN1993, FLAMMABLE LIQUIDS, N.O.S. (Xylenes, Ethylbenzene), 3, PG III

LAND (TDG)

Proper Shipping Name: FLAMMABLE LIQUIDS, N.O.S. (Xylenes, Ethylbenzene)
Hazard Class & Division: 3
UN Number: 1993
Packing Group: III
Special Provisions: 16

SEA (IMDG)
Proper Shipping Name: XYLENES
Hazard Class & Division: 3
EMS Number: F-E, S-D
UN Number: 1307
Packing Group: III
Label(s): 3
Transport Document Name: UN1307, XYLENES, 3, PG III, (23°C c.c.)

AIR (IATA)
Proper Shipping Name: XYLENES
Hazard Class & Division: 3
UN Number: 1307
Packing Group: III
Label(s) / Mark(s): 3
Transport Document Name: UN1307, XYLENES, 3, PG III

SECTION 15 REGULATORY INFORMATION

OSHA HAZARD COMMUNICATION STANDARD: When used for its intended purpose, this material is classified as hazardous in accordance with OSHA 29CFR 1910.1200.

Complies with the following national/regional chemical inventory requirements:: AICS, KECI, ENCS, DSL, IECSC, PICCS, TSCA

EPCRA: This material contains no extremely hazardous substances.

CERCLA:

Chemical Name	CAS Number	Typical Value	Component RQ	Product RQ
ETHYL BENZENE	100-41-4	10 - 20%	1000 LBS	5000 LBS
Mixed Xylenes	1330-20-7	100 %	100 LBS	100 LBS

SARA (311/312) REPORTABLE HAZARD CATEGORIES: Fire. Immediate Health. Delayed Health.

SARA (313) TOXIC RELEASE INVENTORY:

Chemical Name	CAS Number	Typical Value
Mixed Xylenes	1330-20-7	100 %
ETHYL BENZENE	100-41-4	10 - 20%

The following ingredients are cited on the lists below:

Chemical Name	CAS Number	List Citations
ETHYL BENZENE	100-41-4	1, 4, 10, 13, 16, 17, 18, 19
Mixed Xylenes	1330-20-7	1, 4, 5, 9, 13, 15, 16, 17, 18, 19

--REGULATORY LISTS SEARCHED--

1 = ACGIH ALL	6 = TSCA 5a2	11 = CA P65 REPRO	16 = MN RTK
2 = ACGIH A1	7 = TSCA 5e	12 = CA RTK	17 = NJ RTK
3 = ACGIH A2	8 = TSCA 6	13 = IL RTK	18 = PA RTK
4 = OSHA Z	9 = TSCA 12b	14 = LA RTK	19 = RI RTK
5 = TSCA 4	10 = CA P65 CARC	15 = MI 293	

Code key: CARC=Carcinogen; REPRO=Reproductive

SECTION 16 OTHER INFORMATION

N/D = Not determined, N/A = Not applicable

THIS SAFETY DATA SHEET CONTAINS THE FOLLOWING REVISIONS:

Revision Changes:
Section 15: CERCLA Table was modified.
Section 15: SARA (313) TOXIC RELEASE INVENTORY - Table was modified.
Section 15: National Chemical Inventory Listing was modified.
Section 08: Exposure Limits Table was modified.
Section 06: Protective Measures was modified.
Section 09: Vapor Pressure was added.
Section 12: Photolysis - Header was added.
Section 09: Phys/Chem Properties Note was modified.
Section 09: Boiling Point C(F) was modified.
Section 09: Pour Point - Header was added.
Section 09: Pour Point C(F) was added.
Section 09: Density kg/m3(lbs/gal) was modified.
Section 09: Evaporation Rate was modified.
Section 09: Flash Point C(F) was modified.
Section 09: n-Octanol/Water Partition Coefficient was modified.
Section 09: Molecular Weight was modified.
Section 09: Coefficient of Thermal Expansion was modified.
Section 09: VAPOR PRESSURE was deleted.
Section 09: Vapor Pressure was modified.
Section 11: Dermal Lethality Test Data was modified.
Section 11: Dermal Lethality Test Comment was modified.
Section 11: Oral Lethality Test Data was modified.
Section 11: Inhalation Lethality Test Data was modified.
Section 11: Oral Lethality Test Comment was modified.
Section 11: Inhalation Lethality Test Comment was modified.
Section 11: Dermal Irritation Test Comment was modified.
Section 11: Eye Irritation Test Comment was modified.
Section 11: Inhalation Irritation Test Data was modified.
Section 09: Flammable Limits - LEL was modified.
Section 09: Flash Point C(F) was modified.
Section 09: Autoignition Temperature was modified.

Section 09: Viscosity was modified.
Section 14: Transport Document Name was added.
Section 14: Transport Document Name was added.
Section 14: Product RQ was modified.
Section 14: Transport Document Name was added.
Composition: Component table was modified.
Section 15: List Citations Table was modified.
Section 11: Inhalation Lethality Test Comment was modified.
Section 15: National Chemical Inventory Listing - Header was modified.
Section 09: Relative Density was modified.
Section 16: Precautions was modified.
Section 16: Water Spill was modified.
Section 16: NA Contains was modified.
Section 09: Freezing Point C(F) was modified.
Section 09: Melting Point C(F) was modified.
Section 12: Ecological Information - Hydrolysis was added.
Section 12: Ecological Information - Photolysis was added.
Section 12: Ecological Information - Hydrolysis was added.
Section 12: Ecological Information - Photolysis was added.
Section 09: Decomposition Temperature was added.
Section 09: Decomposition Temp - Header was added.
Section 12: Ecological Information - Acute Aquatic Toxicity was added.
Section 12: Ecological Information - Acute Aquatic Toxicity was added.
Section 09: Vapor Pressure was added.
Section 12: Hydrolysis - Header was added.

PRECAUTIONARY LABEL TEXT:
Contains: Mixed Xylenes
WARNING!
HEALTH HAZARDS
Irritating to eyes. Possible human cancer hazard. If swallowed, may be aspirated and cause lung damage.
Target Organs: Eye |

PHYSICAL HAZARDS
Flammable. Material can accumulate static charges which may cause an ignition. Flammable.

PRECAUTIONS
Avoid contact with skin. Avoid contact with eyes. Prevent exposure to ignition sources, for example use non-sparking tools and explosion-proof equipment. Use proper bonding and/or ground procedures. However, bonding and grounds may not eliminate the hazard from static accumulation.

FIRST AID
Eye: Flush thoroughly with water for at least 15 minutes. Get medical assistance.

Oral: Seek immediate medical attention. Do not induce vomiting.

Skin: Wash contact areas with soap and water. Remove contaminated clothing. Launder contaminated clothing before reuse.

FIRE FIGHTING MEDIA
Use water fog, foam, dry chemical or carbon dioxide (CO_2) to extinguish flames.

SPILL/LEAK

Land Spill: Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Stop leak if you can do it without risk. Prevent entry into waterways, sewer, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.

Water Spill: Stop leak if you can do it without risk. Eliminate sources of ignition. Warn other shipping. Report spills as required to appropriate authorities. If the Flash Point exceeds the Ambient Temperature by 10 degrees C or more, use containment booms and remove from the surface by skimming or with suitable absorbents when conditions permit. If the Flash Point does not exceed the Ambient Air Temperature by at least 10C, use booms as a barrier to protect shorelines and allow material to evaporate. Seek the advice of a specialist before using dispersants.

This warning is given to comply with California Health and Safety Code 25249.6 and does not constitute an admission or a waiver of rights. This product contains a chemical known to the State of California to cause cancer.

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SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.2
Revision Date 01/06/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Vinyl chloride

Product Number : 387622
Brand : Aldrich

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Chloroethylene

Formula : C_2H_3Cl

CAS-No.	EC-No.	Index-No.	Concentration
Vinyl chloride			
75-01-4	200-831-0	602-023-00-7	-
Hydroquinone			
123-31-9	204-617-8	604-005-00-4	<= 0.0001 %
Phenol			
108-95-2	203-632-7	604-001-00-2	<= 0.01 %

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable gas, Compressed Gas, Carcinogen, Toxic by ingestion

Target Organs

Liver, Blood, Brain., Central nervous system

HMIS Classification
Health hazard: 2
Chronic Health Hazard: *
Flammability: 4
Physical hazards: 3

NFPA Rating

Health hazard: 2
Fire: 4
Reactivity Hazard: 0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Toxic if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	-61.0 °C (-77.8 °F) - closed cup
Ignition temperature	no data available

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods for cleaning up
Wipe up with absorbent material (e.g. cloth, fleece).

7. HANDLING AND STORAGE

Handling
Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge. Use explosion-proof equipment.

Storage
Keep container tightly closed in a dry and well-ventilated place. Store in cool place.

Contents under pressure. Light sensitive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Vinyl chloride	75-01-4	TWA	1 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Liver damage Lung cancer Confirmed human carcinogen: The agent is carcinogenic to humans based on the weight of evidence from epidemiologic studies.				
		TWA	1 ppm	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Sec. 1910.1017 Vinyl Chloride.				
		STEL	5 ppm	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Sec. 1910.1017 Vinyl Chloride.				
		TWA	1 ppm	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		STEL	5 ppm	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	See 1910.1017				
Hydroquinone	123-31-9	TWA	1 mg/m3	2008-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Eye irritation Eye damage 2008 Adoption Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is lilkely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure. Sensitizer				
		TWA	2 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	2 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) -

					Table Z-1 Limits for Air Contaminants

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	Compressed gas

Safety data

pH	no data available
Melting point	-153.8 °C (-244.8 °F) - lit.
Boiling point	-13.4 °C (7.9 °F) - lit.
Flash point	-61.0 °C (-77.8 °F) - closed cup
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	0.911 g/cm3 at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Chemically active metals, Copper

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Contains the following stabiliser(s):
Hydroquinone (>=0 - <=0.0001 %)
Phenol (>=0 - <=0.01 %)

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Oral - rat - 500.0 mg/kg

LC50 Inhalation - rat - 0.3 h - 180000 ppm
Remarks: Behavioral:Tremor. Behavioral:Convulsions or effect on seizure threshold. Respiratory disorder

Irritation and corrosion

no data available

Sensitisation

no data available

Chronic exposure

This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

IARC: 1 - Group 1: Carcinogenic to humans (Vinyl chloride)

1 - Group 1: Carcinogenic to humans (Vinyl chloride)

NTP: Known to be human carcinogen (Vinyl chloride)

Overexposure may cause reproductive disorder(s) based on tests with laboratory animals.

Signs and Symptoms of Exposure

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	Toxic if swallowed.
Target Organs	Liver, Blood, Brain., Central nervous system,

Additional Information
RTECS: KU9625000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

no data available

Further information on ecology

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1086 Class: 2.1
Proper shipping name: Vinyl chloride, stabilized
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1086 Class: 2.1 EMS-No: F-D, S-U
Proper shipping name: VINYL CHLORIDE, STABILIZED
Marine pollutant: No

IATA
UN-Number: 1086 Class: 2.1
Proper shipping name: Vinyl chloride, stabilized
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

OSHA Hazards
Flammable gas, Compressed Gas, Carcinogen, Toxic by ingestion

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-07-01

SARA 313 Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Sudden Release of Pressure Hazard, Acute Health Hazard, Chronic Health Hazard
Reportable Quantity : lowest RQ > 999999 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Phenol	108-95-2	2007-07-01
Hydroquinone	123-31-9	2007-07-01
Vinyl chloride	75-01-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinyl chloride	75-01-4	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Vinyl chloride	75-01-4	1990-06-15

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.0
Revision Date 03/12/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Toluene
Product Number	:	244511
Brand	:	Sigma-Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Irritant, Teratogen, Reproductive hazard

Target Organs

Bladder, Liver, Kidney, Brain.

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
H361	Suspected of damaging fertility or the unborn child.
H371	May cause damage to organs.
H401	Toxic to aquatic life.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P281	Use personal protective equipment as required.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	0

NFPA Rating

Health hazard: 2
Fire: 3
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : C_7H_8
Molecular Weight : 92.14 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Toluene			
108-88-3	203-625-9	601-021-00-3	-

4. FIRST AID MEASURES

General advice
Move out of dangerous area.Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

Handle and store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Toluene	108-88-3	TWA	100 ppm 375 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	150 ppm 560 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	200 ppm	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z2
Remarks	Z37.12-1967				
		CEIL	300 ppm	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.12-1967				
		Peak	500 ppm	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z2
	Z37.12-1967				
		TWA	20 ppm	2008-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Visual impairment Female reproductive Pregnancy loss 2008 Adoption Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of

workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	colourless

Safety data

pH	no data available
Melting point	-93 °C (-135 °F)
Boiling point	110 - 111 °C (230 - 232 °F)
Flash point	4.0 °C (39.2 °F) - closed cup
Ignition temperature	535 °C (995 °F)
Lower explosion limit	1.2 %(V)
Upper explosion limit	7 %(V)
Vapour pressure	29.1 hPa (21.8 mmHg) at 20.0 °C (68.0 °F)
Density	0.865 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - > 5,580 mg/kg

LC50 Inhalation - rat - 4 h - 12,500 - 28,800 mg/m3

LD50 Dermal - rabbit - 12,196 mg/kg

Skin corrosion/irritation
Skin - rabbit - Skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Severe eye irritation - 24 h

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Toluene)

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
Damage to fetus possible
Suspected human reproductive toxicant

Reproductive toxicity - rat - Inhalation
Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).

Experiments have shown reproductive toxicity effects in male and female laboratory animals.

Developmental Toxicity - rat - Oral
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Specific target organ toxicity - single exposure (GHS)
May cause damage to organs.

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.
Ingestion	Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Lung irritation, chest pain, pulmonary edema, Inhalation studies on toluene have demonstrated the development of inflammatory and ulcerous lesions of the penis, prepuce, and scrotum in animals.

Additional Information
RTECS: XS5250000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Lepomis macrochirus (Bluegill) - 74.00 - 340.00 mg/l - 96 h
	LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h
	NOEC - Pimephales promelas (fathead minnow) - 5.44 mg/l - 7 d
	LOEC - Pimephales promelas (fathead minnow) - 8.04 mg/l - 7 d
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 8.00 mg/l - 24 h
	Immobilization EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h
Toxicity to algae	EC50 - Chlorella vulgaris (Fresh water algae) - 245.00 mg/l - 24 h
	EC50 - Pseudokirchneriella subcapitata (green algae) - 10.00 mg/l - 24 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Leuciscus idus (Golden orfe) - 3 d Bioconcentration factor (BCF): 94

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1294 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: TOLUENE
Marine pollutant: No

IATA
UN-Number: 1294 Class: 3 Packing group: II
Proper shipping name: Toluene

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Irritant, Teratogen, Reproductive hazard

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Toluene	108-88-3	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Toluene	108-88-3	2007-09-28

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/22/2006
Date Updated: 02/02/2006
Version 1.3

Section 1 - Product and Company Information

Product Name	TERT-BUTYLBENZENE, STANDARD FOR GC
Product Number	19640
Brand	FLUKA
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
TERT-BUTYLBENZENE	98-06-6	No

Formula	C10H14
Synonyms	Benzene, (1,1-dimethylethyl)- (9CI) * tert-Butylbenzene * Dimethylethylbenzene * 2-Methyl-2-phenylpropane * Phenyltrimethylmethane * Pseudobutylbenzene * Trimethylphenylmethane
RTECS Number:	CY9120000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Flammable.
Toxic by inhalation and if swallowed. Irritating to eyes and skin.
Danger: Poison. May be fatal or cause blindness if swallowed.
Vapor harmful. Cannot be made non-poisonous. Causes irritation.
Target organ(s): Eyes. Kidneys.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE

If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE

If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

Section 5 - Fire Fighting Measures

EXPLOSION HAZARDS

Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions. Forms explosive mixtures in air.

FLASH POINT
140 ˚F 60 ˚C Method: closed cup

EXPLOSION LIMITS
Lower: 0.8 %

AUTOIGNITION TEMP
450 ˚C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Vapor may travel considerable distance to source of ignition and flash back.
Specific Method(s) of Fire Fighting: Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with an activated carbon adsorbent, take up and place in closed containers. Transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Avoid contact with eyes, skin, and clothing.

STORAGE
Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame. Store in a cool dry place.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Mechanical exhaust required. Safety shower and eye bath. Use nonsparking tools.

PERSONAL PROTECTIVE EQUIPMENT
Other: Wear appropriate government approved respirator, chemical-resistant gloves, safety goggles, other protective

clothing.

GENERAL HYGIENE MEASURES
Remove and wash contaminated clothing promptly. Wash thoroughly after handling.

Section 9 - Physical/Chemical Properties

Appearance	Color: Colorless Form: Clear liquid	
Property	Value	At Temperature or Pressure
Molecular Weight	134.22 AMU	
pH	N/A	
BP/BP Range	167.0 - 168.0 ˚C	
MP/MP Range	- 58.0 ˚C	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	3.16 g/l	169 ˚C
Saturated Vapor Conc.	N/A	
SG/Density	0.866 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	140 ˚F 60 ˚C	Method: closed cup
Explosion Limits	Lower: 0.8 %	
Flammability	N/A	
Autoignition Temp	450 ˚C	
Refractive Index	1.493	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Materials to Avoid: Oxidizing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Multiple Routes: May be harmful by inhalation, ingestion, or skin absorption. May cause irritation.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

TOXICITY DATA

Oral
Rat
3045 mg/kg
LD50
Remarks: Gastrointestinal:Changes in structure or function of salivary glands. Behavioral:Tremor. Behavioral:Somnolence (general depressed activity).

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Butyl benzenes
UN#: 2709
Class: 3
Packing Group: Packing Group III
Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: Butylbenzenes
IATA UN Number: 2709
Hazard Class: 3
Packing Group: III

Section 15 - Regulatory Information

EU ADDITIONAL CLASSIFICATION
Symbol of Danger: Xn
Indication of Danger: Harmful.
R: 10-20-38
Risk Statements: Flammable. Harmful by inhalation. Irritating to skin.
S: 23-24/25
Safety Statements: Do not breathe vapor. Avoid contact with skin and eyes.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable.
Risk Statements: Toxic by inhalation and if swallowed. Irritating to eyes and skin.
Safety Statements: Keep away from sources of ignition - no smoking.
US Statements: Danger: Poison. May be fatal or cause blindness if swallowed. Vapor harmful. Cannot be made non-poisonous. Causes irritation. Target organ(s): Eyes. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No

NOTES: This product is subject to SARA section 313 reporting requirements. This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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MATERIAL SAFETY DATA SHEET

Date Printed: 05/16/2006
Date Updated: 02/01/2006
Version 1.9

Section 1 - Product and Company Information

Product Name	TRICHLOROETHENE
Product Number	46267
Brand	RIEDEL
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
1,1,2-TRICHLOROETHYLENE	79-01-6	Yes

Formula C2HCl3

Synonyms Acetylene trichloride * Algylen * Anamenth * Benzinol * Blacosolv * Blancosolv * Cecolene * Chlorilen * 1-Chloro-2,2-dichloroethylene * Chlorylen * Circosolv * Crawhaspol * Densinfluat * 1,1-Dichloro-2-chloroethylene * Dow-tri * Dukeron * Ethinyl trichloride * Ethylene trichloride * Fleck-flip * Flock FLIP * Fluate * Germalgene * Lanadin * Lethurin * Narcogen * Narkosoid * NCI-C04546 * Nialk * Perm-A-chlor * Petzinol * Philex * RCRA waste number U228 * Threthylen * Threthylene * Trethylene * Tri * Triad * Trial * Triasol * Trichlooretheen (Dutch) * Trichloorethyleen, tri (Dutch) * Trichloraethen (German) * Trichloraethylen, tri (German) * Trichloran * Trichloren * Trichlorethylene, tri (French) * Trichloroethene * Trichloroethylene (IUPAC) * 1,1,2-Trichloroethylene * 1,2,2-Trichloroethylene * Trichloroethylene (ACGIH:OSHA) * Tri-clene * Tricloretene (Italian) * Tricloroetilene (Italian) * Trielene * Trielin * Trielina (Italian) * Trieline * Trilen * Trilene * Trilene TE-141 * Triline * Trimar * Triol * Tri-plus * Tri-plus M * Vestrol * Vitran * Westrosol

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic.
May cause cancer. Irritating to eyes, respiratory system and skin. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Vapors may cause drowsiness and dizziness. Possible risk of irreversible effects.
Target organ(s): Liver. Central nervous system. Calif. Prop. 65

carcinogen.

HMIS RATING
HEALTH: 2*
FLAMMABILITY: 0
REACTIVITY: 1

NFPA RATING
HEALTH: 2
FLAMMABILITY: 0
REACTIVITY: 1

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

EXPLOSION LIMITS
Lower: 8 % Upper: 10.5 %

AUTOIGNITION TEMP
410 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP
Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Handle and store under nitrogen.
Store in a cool dry place.
Store at 2-8°C

SPECIAL REQUIREMENTS
Light sensitive. Handle and store under inert gas.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	STEL	100 PPM
USA	ACGIH	TWA	50 PPM
USA	MSHA Standard-air	TWA	100 PPM (535 MG/M3)
USA	OSHA.	PEL	8H TWA 100 PPM;CL 200;PK 300/5
New Zealand OEL			
Remarks: check ACGIH TLV			
USA	NIOSH	TWA	25 PPM
		Ceiling co2 PPM/1H	

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	50 MG/M3
Poland		NDSCh	400 MG/M3
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance	Physical State: Clear liquid Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	131.39 AMU	
pH	N/A	
BP/BP Range	86.0 - 88.0 °C	
MP/MP Range	- 84.8 °C	
Freezing Point	N/A	
Vapor Pressure	61 mmHg	20 °C
Vapor Density	4.5 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.463 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	Log Kow: 2.29	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	Lower: 8 % Upper: 10.5 %	
Flammability	N/A	
Autoignition Temp	410 °C	
Refractive Index	1.478	
Optical Rotation	N/A	
Miscellaneous Data	N/A	
Solubility	N/A	

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Conditions of Instability: Light sensitive.
Materials to Avoid: Oxidizing agents, Strong bases, Magnesium.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Hydrogen chloride gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: May cause eye irritation.
Inhalation: May be harmful if inhaled. Material may be irritating to mucous membranes and upper respiratory tract.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Lungs. Heart. Central nervous system. Liver.

SIGNS AND SYMPTOMS OF EXPOSURE
Exposure to and/or consumption of alcohol may increase toxic effects. Exposure can cause: Gastrointestinal disturbances. Damage to the kidneys. Narcotic effect. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting.

TOXICITY DATA

Oral
Human
7000 mg/kg
LDLO

Inhalation
Man
2,900 ppm
LCLO

Oral
Rat
4920 mg/kg
LD50

Intraperitoneal
Rat
1282 MG/KG
LD50

Oral
Mouse
2402 mg/kg
LD50
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Ataxia. Skin and Appendages: Other: Hair.

Inhalation
Mouse
8,450 ppm
LC50

Subcutaneous
Mouse
16 GM/KG
LD50
Remarks: Behavioral:Sleep. Behavioral:Ataxia.

Intravenous
Mouse
33900 UG/KG
LD50

Intraperitoneal
Dog
1900 MG/KG
LD50
Remarks: Liver:Liver function tests impaired.

Skin
Rabbit
> 20000 mg/kg
LD50

IRRITATION DATA

Skin
Rabbit
2 mg
24H
Remarks: Severe irritation effect

Eyes
Rabbit
20 mg
24H
Remarks: Moderate irritation effect

CHRONIC EXPOSURE - CARCINOGEN
Result: This product is or contains a component that has been reported to be probably carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Inhalation
Dose: 150 PPM
Exposure Time: 7H/2Y
Frequency: I
Result: Skin and Appendages: Other: Tumors. Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 455 GM/KG
Exposure Time: 78W
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Species: Mouse
Route of Application: Inhalation
Dose: 150 PPM
Exposure Time: 7H/2Y
Frequency: I
Result: Lungs, Thorax, or Respiration:Tumors. Vascular:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Hamster
Route of Application: Inhalation
Dose: 100 PPM
Exposure Time: 6H/77W
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Blood:Lymphomas including Hodgkin's disease. Liver:Tumors.

Species: Mouse
Route of Application: Oral
Dose: 912 GM/KG
Exposure Time: 78W

Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors.

Species: Mouse
Route of Application: Inhalation
Dose: 500 PPM
Exposure Time: 6H/77W
Frequency: I
Result: Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Blood:Lymphomas including Hodgkin's disease.

Species: Mouse
Route of Application: Inhalation
Dose: 150 PPM
Exposure Time: 7H/2Y
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Lungs, Thorax, or Respiration:Tumors. Skin and Appendages: Other: Tumors.

Species: Mouse
Route of Application: Oral
Dose: 515 GM/KG
Exposure Time: 2Y
Frequency: I
Result: Tumorigenic:Carcinogenic by RTECS criteria. Liver:Tumors. Blood:Tumors.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Clear evidence.
Species: Mouse
Route: Gavage

ACGIH CARCINOGEN LIST

Rating: A5

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 1140 MG/KG
Route of Application: Oral
Exposure Time: (14D PRE-21D POST)
Result: Specific Developmental Abnormalities: Central nervous system.

Species: Rat
Dose: 1800 PPM/24H
Route of Application: Inhalation
Exposure Time: (1-20D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Other developmental abnormalities.

Species: Rat
Dose: 1800 PPM/6H
Route of Application: Inhalation

Exposure Time: (1-20D PREG)
Result: Specific Developmental Abnormalities: Urogenital system.

Species: Rat
Dose: 100 PPM/4H
Route of Application: Inhalation
Exposure Time: (8-21D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.

Species: Mouse
Dose: 150 PPM/24H
Route of Application: Inhalation
Exposure Time: (4W MALE/4W PRE-3W PREG)
Result: Specific Developmental Abnormalities: Central nervous system.

CHRONIC EXPOSURE - MUTAGEN
Result: Laboratory experiments have shown mutagenic effects.

Species: Human
Dose: 100 MG/L
Cell Type: lung
Mutation test: Unscheduled DNA synthesis

Species: Human
Dose: 5 ML/L
Cell Type: lymphocyte
Mutation test: DNA inhibition

Species: Human
Dose: 178 MG/L
Cell Type: lymphocyte
Mutation test: Sister chromatid exchange

Species: Rat
Route: Inhalation
Dose: 5 PPM
Exposure Time: 6H
Mutation test: Micronucleus test

Species: Rat
Route: Oral
Dose: 4 MMOL/KG
Mutation test: Micronucleus test

Species: Rat
Dose: 1100 UMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Rat
Dose: 100 UMOL/L
Cell Type: liver
Mutation test: DNA damage

Species: Rat
Dose: 2800 UMOL/L
Cell Type: liver
Mutation test: Unscheduled DNA synthesis

Species: Rat

Route: Oral
Dose: 16500 MG/KG
Exposure Time: 3W
Mutation test: Unscheduled DNA synthesis

Species: Mouse
Route: Intraperitoneal
Dose: 1 GM/KG
Mutation test: Micronucleus test

Species: Mouse
Dose: 146 MG/L (+S9)
Cell Type: lymphocyte
Mutation test: Mutation in microorganisms

Species: Mouse
Route: Intraperitoneal
Dose: 140 MG/KG
Mutation test: specific locus test

Species: Mouse
Dose: 20 MG/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Mouse
Route: Intraperitoneal
Dose: 6 MMOL/KG
Mutation test: DNA damage

Species: Mouse
Dose: 100 UMOL/L
Cell Type: liver
Mutation test: DNA damage

Species: Mouse
Route: Oral
Dose: 2500 MG/L
Mutation test: Unscheduled DNA synthesis

Species: Mouse
Dose: 1 MMOL/L
Cell Type: Bone marrow
Mutation test: Unscheduled DNA synthesis

Species: Mouse
Route: Oral
Dose: 600 MG/KG
Mutation test: Other mutation test systems

Species: Mouse
Dose: 400 MG/KG
Cell Type: S. cerevisiac
Mutation test: Host-mediated assay

Species: Mouse
Route: Inhalation
Dose: 100 PPM
Mutation test: sperm

Species: Hamster
Dose: 5 MG/L

Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Hamster
Dose: 1 PPH
Cell Type: fibroblast
Mutation test: Other mutation test systems

Species: Hamster
Dose: 401 MG/L
Cell Type: ovary
Mutation test: Sister chromatid exchange

Species: Hamster
Dose: 1150 UMOL/L
Cell Type: lung
Mutation test: SLN

Species: Mammal
Dose: 1 MMOL/L
Cell Type: lymphocyte
Mutation test: DNA

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 2688 MG/KG
Route of Application: Oral
Exposure Time: (1-22D PREG/21D POST)
Result: Effects on Newborn: Behavioral.

Species: Rat
Dose: 36 GM/KG
Route of Application: Oral
Exposure Time: (15D PRE/1-21D PREG)
Result: Effects on Newborn: Weaning or lactation index (e.g., # alive at weaning per # alive at day 4).

Species: Rat
Dose: 100 PPM/4H
Route of Application: Inhalation
Exposure Time: (6-22D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants). Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 100 PPM/7H
Route of Application: Inhalation
Exposure Time: (5D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).

Section 12 - Ecological Information

ACCUMULATION

Bioaccumulation Potential: No indication of bioaccumulation.

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Species: Pimephales promelas (Fathead minnow)
Time: 96 h
Value: 41 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 18 mg/l

Test Type: IC50 Algae
Species: Selenastrum capricornutum resp.
Time: 96 h
Value: 175 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Dannish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT
Proper Shipping Name: Trichloroethylene
UN#: 1710
Class: 6.1
Packing Group: Packing Group III
Hazard Label: Toxic Substance
PIH: Not PIH

IATA
Proper Shipping Name: Trichloroethylene
IATA UN Number: 1710
Hazard Class: 6.1
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 45-36/38-52/53-67-68
Risk Statements: May cause cancer. Irritating to eyes and skin. Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Vapors may cause drowsiness and dizziness. Also possible risks of irreversible effects.
S: 53-45-61
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic.
Risk Statements: May cause cancer. Irritating to eyes, respiratory system and skin. Harmful to aquatic organisms, may

cause long-term adverse effects in the aquatic environment. Vapors may cause drowsiness and dizziness. Possible risk of irreversible effects.
Safety Statements: Restricted to professional users. Attention - Avoid exposure - obtain special instructions before use. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). Avoid release to the environment. Refer to special instructions/safety data sheets.
US Statements: Target organ(s): Liver. Central nervous system. Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.
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SCHUMACHER

Material Safety Data Sheet

TRANS-LC
Part No. 1315-0002 D
May1999

1. Chemical Product and Company Identification

Chemical Name: **TRANS-LC® (trans 1,2-Dichloroethene)**

Synonyms:	trans-1,2-dichloroethylene; trans-dichloroethylene acetylene dichloride, Dioform	***Chemical Family:***	Chlorinated Unsaturated Hydrocarbon
Formula:	$C_2H_2\ Cl_2$	***Molecular Weight:***	96.94
CAS#:	156-60-5		

SCHUMACHER, 1969 PALOMAR OAKS WAY, CARLSBAD, CA 92009 • EMERGENCY PHONE NUMBERS: 8:00 AM TO 5:00 PM PST Monday thru Friday, call: 760-931-9555. AFTER HOURS CALL: 1-800-523-9374; IN PENNSYLVANIA: 1-800-322-9092; OUTSIDE THE USA: 610-481-7711

2. Composition

Chemical Name	***CAS#***	***% by weight***
trans-1,2-Dichloroethylene	156-60-5	100

3. Hazard Identification

Emergency Overview: Clear, colorless liquid. Sweet order. Contact may cause eye, skin and mucous membrane irritation. Flammable liquid. Vapors may flashback. Fire may produce irritating or poisonous gases. Contaminated run-off water to sewer may create a fire or explosion hazard.

Potential Health Effects

Inhalation: May cause dizziness, headache, nausea, vomiting, and tremors. Causes depression of the central nervous system (CNS).

Eye Contact: May cause eye irritation.

Skin Contact: Can act as primary irritant and produce dermatitis.

Ingestion: May cause nausea and vomiting. Slight to deep depression of the CNS.

Chronic/Carcinogenicity: Chronic exposure may cause damage to the lung, liver and kidneys. Not listed as a carcinogen by OSHA, IARC and NTP. Tests have shown non-mutagenicity.

4. First Aid Measures

Inhalation: Remove to fresh air. Give artificial respiration if not breathing. Oxygen may be given by qualified personnel if breathing is difficult. Get immediate medical attention.

Eye Contact: Immediately flush with plenty of water for at least 15 minutes. Get immediate medical attention.

Skin Contact: Immediately wash with soap or mild detergent and flush skin with plenty of water. Remove contaminated clothing. Get medical attention.

Ingestion: Get medical attention immediately. Do not induce vomiting.

Legal responsibility is assumed only for the fact that all studies reported here and all opinions are those of qualified experts.

SCHUMACHER

Material Safety Data Sheet

5. Fire Fighting Measures

Flash Point (Test Method):	<2°C (COC)
Auto-Ignition Temperature:	460°C
Flammable Limits in Air, % by volume:	Lower: 9.0% Upper: 16.5% Lower in pure oxygen: 6%
Extinguishing Media:	Water spray, carbon dioxide, dry chemical powder, foam, and fog. Water used in solid streams may not be effective. For larger fires, flood area with water from a distance.
Special Fire Fighting Procedures:	Use positive-pressure self-contained breathing apparatus (SCBA) and full personal protective equipment (PPE). Do not get water inside the chemical container.
Unusual Fire and Explosion Hazards:	Flammable liquid, dangerous fire hazard. Emits toxic, corrosive fumes under fire conditions. Vapor is heavier than air and may travel along surfaces for considerable distances to an ignition source and flash back. Closed containers may rupture violently when heated.

6. Accidental Release Measures

Isolate hazard area. Eliminate ignition sources and moisture. Keep unnecessary and unprotected personnel from entering. In emergency entry where an unknown concentration exists, wear positive pressure breathing apparatus and full PPE. See **Exposure Control/Personal Protection** section. Absorb with inert material (e.g., activated carbon, vermiculite, dry sand). Place in appropriate chemical waste container.

7. Handling and Storage

Store in a standard flammable liquids storage room or cabinet, separate from oxidizers. Keep away from moisture. Store in a cool, dry, well ventilated area. Wear appropriate PPE when handling this chemical. Avoid skin contact and breathing vapors.

8. Exposure Control/Personal Protection

Engineering Controls:	Use process enclosures, local exhaust ventilation or other engineering controls to maintain airborne levels below Exposure Guidelines. An eyewash and safety shower should be readily accessible.
Respiratory Protection:	Use a NIOSH/MSHA full face respirator with organic vapor cartridge(s) when the airborne concentration is les than 1000 ppm. In an emergency or when the airborne concentration is greater than 1000 ppm, use positive pressure self-contained breathing apparatus (SCBA).
Skin Protection:	When chemical contact is possible, wear Viton or polyvinyl alcohol gloves, splash apron, work uniform and shoes or coverlets to prevent skin contact.
Eye Protection:	Use approved safety goggles or safety glasses with side shields worn with a face shield to prevent liquid splash contact.
Exposure Guidelines:	OSHA PEL 200 ppm; ACGIH TLV-TWA 200 ppm; TLV-STEL: Not Available; TLV-IDLH 4000 ppm.

Legal responsibility is assumed only for the fact that all studies reported here and all opinions are those of qualified experts.

SCHUMACHER

Material Safety Data Sheet

9. Physical and Chemical Properties

Boiling Point:	48° C	***Freezing Point:***	-50° C
Specific Gravity at 20°C (H_2O=1):	1.257	***Vapor Pressure at 20° C:***	250 Torr
Vapor Density at 48°C (air=1):	3.67	***Solubility in Water, % by wt.:***	0.63
Percent Volatile by Volume:	100%	***Evaporation Rate:***	Not Available
Appearance and Odor:	Clear, colorless liquid. Sweet odor; detectable at 0.08 ppm	***pH:***	Not Available

10. Stability and Reactivity

Chemical Stability: Stable

Conditions to Avoid: Heat, sparks and flame can ignite material. Decomposition by exposure to air, light, and moisture.

Incompatibility (Materials to Avoid): Exposure to alkalis, sulfuric acid, or copper and its alloys produces explosive or spontaneously flammable, chloroacetylene. Avoid amines, aluminum and its alloys, and other reducing agents such as sodium, magnesium and zinc. A fire or explosion hazard also exists when exposed to strong oxidizing agents, ozone, or nitrogen tetroxide. Reacts with rubber, plastics and coatings (causes swelling).

Hazardous Decomposition Products: Hydrochloric chloride gas, carbon monoxide, phosgene.

Hazardous Polymerization: Will not occur.

11. Toxicological Information

Toxicology: Trans 1,2-Dichloroethene is toxic by ingestion, inhalation, skin or eye contact. Inhalation may cause nausea, vomiting, weakness, tremors, and epigastric cramps. Ingestion can cause slight to deep CNS depression. Skin contact may cause irritation or dermatitis. Eye contact may cause irritation, inflammation and opacity of the eye. Primarily excreted through the lungs. Tests show no mutagenic effects.

Target Organs: Eye, skin, lung, liver, kidney, mucous membranes, central nervous system (CNS).

Chronic Effects: To the best of our knowledge the chronic effects have not been thoroughly investigated.

lhl-hmn	TC50: > 3000 ppm, 8 hr.	Oral-rat	LD50: > 5000 mg/kg
lhl-hmn	LD50: > 5000 mg/kg	Skin/Eye Irritation:	1.1/8 mean/45/110 max.

Legal responsibility is assumed only for the fact that all studies reported here and all opinions are those of qualified experts.

SCHUMACHER

Material Safety Data Sheet

TRANS-LC
Part No. 1315-0002 D
May1999

12. Ecological Information

If released to the soil, the material should leach into the groundwater. It will be lost from the water primarily by volatilization (half-life is 3 hours in a model river). Biodegradation, adsorption to sediment, and bioconcentration (BCF:22) in aquatic organisms should not be significant. If released to the atmosphere, it will be lost by reaction with hydroxy radicals (half-life is 3.6 days) or lost to rain, since it is water soluble.

13. Disposal Considerations

EPA Waste Number D001: Consult an expert for disposal. Any disposal must be in accordance with local, state and federal laws and regulations. Contact local, state or federal administering agency for specific rules.

14. Transport Information

DOT Description		***UN Description***	
Proper Shipping Name:	1,2-Dichloroethylene	***Proper Shipping Name:***	1,2-Dichloroethylene
Hazard Class:	3	***Class or Division:***	3
UN or ID Number:	UN1150	***Packing Group:***	II
		UN or ID Number:	UN1150

15. Regulatory Information

OSHA: Hazard Communication Standard (29 CFR 1910.1200): Yes

TSCA status: Listed in the TSCA Inventory

CERCLA Reportable Quantity (R.Q.): 1000 lbs. (454 kg)

SARA Title III:

- Section 302 Extremely Hazardous Substance: No
- Section 311/312 Hazard Categories: Acute, Fire and Reactive Hazard
- Section 302 Threshold Planning Quantity (TPQ): None
- Section 313: Yes

16. Other Information

National Fire Protection Association Rating - Hazardous Materials Identification System

	NFPA	HMIS
HEALTH	2	2
FIRE	3	3
REACTIVITY	2	3
SPECIAL	N/A	*

(4 = Extreme/Severe, 3 = High/Serious, 2 = Moderate, 1 = Slight, 0 = Minimum, ~~W~~ = Water Reactive, N/A = Not Applicable, * = See Exposure Control/Personal Protection section**)**

Legal responsibility is assumed only for the fact that all studies reported here and all opinions are those of qualified experts.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/22/2006
Date Updated: 09/07/2002
Version 1.2

Section 1 - Product and Company Information

Product Name	EPA TCLP 2,4,5-TP (SILVEX) 1X1ML, MEOH 100UG/ML
Product Number	47897
Brand	SUPELCO
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
EPA TCLP 2,4,5-TP (SILVEX)	None	Yes

Ingredient Name	CAS #	Percent	SARA 313
METHANOL	67-56-1	>= 99 <= 100	Yes
2,4,5-TP	93-72-1	0.01	No

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Flammable (USA) Highly Flammable (EU). Toxic.
Toxic by inhalation and if swallowed. Irritating to eyes and skin.
Target organ(s): Eyes. Kidneys.

HMIS RATING
HEALTH: 2*
FLAMMABILITY: 3
REACTIVITY: 0

NFPA RATING
HEALTH: 2
FLAMMABILITY: 3
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician immediately.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give

artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions.

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Flammable liquid. Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

ENVIRONMENTAL PRECAUTION(S)
Do not allow material to enter drains or water courses. Avoid contaminating sewers and waterways with this material.

Section 7 - Handling and Storage

HANDLING

User Exposure: Do not breathe vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure. Do not use if skin is cut or scratched. Wash thoroughly after handling.

STORAGE
Suitable: Keep tightly closed. Keep away from heat, sparks, and open flame.
Store at 2-8˚C

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use nonsparking tools. Use only in a chemical fume hood.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Use supplied-air or SCBA respirators. Europe permits the use of type AXBEK full-face cartridge respirators (EN 14387).
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Discard contaminated clothing and shoes.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	100 MG/M3
Poland		NDSCh	300 MG/M3
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance Physical State: Liquid

Property	Value	At Temperature or Pressure
pH	N/A	
BP/BP Range	N/A	
MP/MP Range	N/A	
Freezing Point	N/A	
Vapor Pressure	N/A	
Vapor Density	N/A	
Saturated Vapor Conc.	N/A	
SG/Density	N/A	
Bulk Density	N/A	
Odor Threshold	N/A	
Volatile%	N/A	
VOC Content	N/A	
Water Content	N/A	
Solvent Content	N/A	
Evaporation Rate	N/A	
Viscosity	N/A	
Surface Tension	N/A	
Partition Coefficient	N/A	
Decomposition Temp.	N/A	
Flash Point	N/A	
Explosion Limits	N/A	
Flammability	N/A	
Autoignition Temp	N/A	

Refractive Index	N/A
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Acids, Acid chlorides, Acid anhydrides, Oxidizing agents, Alkali metals, Reducing agents.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Hydrogen chloride gas Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: May cause skin irritation.
Skin Absorption: Toxic if absorbed through skin.
Eye Contact: May cause eye irritation.
Inhalation: Material may be irritating to mucous membranes and upper respiratory tract. Toxic if inhaled.
Ingestion: Toxic if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Eyes. Kidneys. Liver. Heart.

SIGNS AND SYMPTOMS OF EXPOSURE
Nausea, headache, and vomiting. Gastrointestinal disturbances. Dizziness. Weakness. Confusion. Drowsiness. Unconsciousness. To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Ingestion can cause: Methyl alcohol may be fatal or cause blindness if swallowed. Cannot be made non-poisonous.

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Methanol
UN#: 1230
Class: 3
Packing Group: Packing Group II

Hazard Label: Flammable liquid
PIH: Not PIH

IATA
Proper Shipping Name: Methanol
IATA UN Number: 1230
Hazard Class: 3
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: T
Indication of Danger: Toxic.
R: 23/24/25-39/23/24/25
Risk Statements: Toxic by inhalation, in contact with skin and if swallowed. Toxic: danger of very serious irreversible effects through inhalation, in contact with skin and if swallowed.
S: 36/37-45
Safety Statements: Wear suitable protective clothing and gloves. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Flammable (USA) Highly Flammable (EU). Toxic.
Risk Statements: Toxic by inhalation and if swallowed. Irritating to eyes and skin.
Safety Statements: Keep container tightly closed. Keep away from sources of ignition - no smoking. Avoid contact with skin. Take precautionary measures against static discharges. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Target organ(s): Eyes. Kidneys.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is or contains a component that is subject to SARA313 reporting requirements.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: No
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

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Material Safety Data Sheet

Version 4.0
Revision Date 07/29/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Silver

Product Number : 327077
Brand : Aldrich

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # : (314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
No known OSHA hazards

HMIS Classification
Health hazard: 0
Flammability: 0
Physical hazards: 0

NFPA Rating
Health hazard: 0
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Ag
Molecular Weight : 107.87 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Silver			
7440-22-4	231-131-3	-	-

4. FIRST AID MEASURES

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact
Wash off with soap and plenty of water.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Avoid breathing vapors, mist or gas.

Environmental precautions
Do not let product enter drains.

Methods and materials for containment and cleaning up
Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Air sensitive. Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Silver	7440-22-4	TWA	0.01 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.01 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.01 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.1 mg/m3	2008-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Argyria				
		TWA	0.01 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
General industrial hygiene practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	flakes

Safety data

pH	no data available
Melting point	960 °C (1,760 °F) - lit.
Boiling point	2,212 °C (4,014 °F) - lit.
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	10.49 g/cm3
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Oxygen, Strong acids and strong bases

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Silver/silver oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - male - > 5,000 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

Carcinogenicity - rat - Unreported
Tumorigenic:Tumors at site or application.

Carcinogenicity classification not possible from current data.

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
May cause argyria (a slate-gray or bluish discoloration of the skin and deep tissues due to the deposit of insoluble albuminate of silver).

Additional Information

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability
no data available

Bioaccumulative potential

Mobility in soil

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Silver)
Reportable Quantity (RQ): 1 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
Not dangerous goods

IATA
Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards
No known OSHA hazards

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Silver	7440-22-4	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.0
Revision Date 03/13/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Selenium
Product Number	:	229865
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect, Toxic by inhalation.

Target Organs

Central nervous system, Liver, Spleen., Gastrointestinal tract, Teeth.

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H301	Toxic if swallowed.
H330	Fatal if inhaled.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P273	Avoid release to the environment.
P284	Wear respiratory protection.
P310	Immediately call a POISON CENTER or doctor/physician.
P501	Dispose of contents/container to an approved waste disposal plant.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	Toxic if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.

Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Se
Molecular Weight : 78.96 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Selenium			
7782-49-2	231-957-4	034-001-00-2	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Store under inert gas. Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control	Update	Basis

			parameters		
Selenium	7782-49-2	TWA	0.2 mg/m3	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Eye & Upper Respiratory Tract irritation				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N99 (US) or type P2 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	light grey

Safety data

pH	no data available
Melting point	217 °C (423 °F) - lit.
Boiling point	684.9 °C (1,264.8 °F) - lit.
Flash point	not applicable
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	4.81 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents, Do not store near acids.

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Selenium/selenium oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
Skin corrosion/irritation

no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Carcinogenicity - mouse - Oral
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Skin and Appendages: Other: Tumors.

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Selenium)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Developmental Toxicity - mouse - Oral
Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Effects on Embryo or Fetus: Fetal death.

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	Toxic if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
anemia, Vomiting, Diarrhoea, Cough, Difficulty in breathing, Acute selenium poisoning produces central nervous system effects, which include nervousness, convulsions, and drowsiness. Other signs of intoxication can include skin eruptions, lassitude, gastrointestinal distress, teeth that are discolored or decayed, odorous ("garlic") breath, and partial loss of hair and nails. Chronic exposure by inhalation can produce symptoms that include pallor, coating of the tongue, anemia, irritation of the mucosa, lumbar pain, liver and spleen damage, as well as any of the other previously mentioned symptoms. Chronic contact with selenium compounds may cause garlic odor of breath and sweat, dermatitis, and moderate emotional instability., Dermatitis, garlic-like breath odor, pallor, nervousness, depression

Additional Information
RTECS: VS7700000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	mortality NOEC - Cyprinodon variegatus (sheepshead minnow) - 2 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 1 mg/l - 96.0 h
	mortality LOEC - Oncorhynchus mykiss (rainbow trout) - 7.8 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	LC50 - Daphnia magna (Water flea) - 0.43 mg/l - 48 h
Toxicity to algae	EC50 - Pseudokirchneriella subcapitata - 99 mg/l - 72 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Lepomis macrochirus - 60 d Bioconcentration factor (BCF): 7.7

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

May cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Selenium)
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Selenium)
Marine pollutant: No

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Selenium)

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect, Toxic by inhalation.

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Selenium	7782-49-2	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Selenium	7782-49-2	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Selenium	7782-49-2	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Selenium	7782-49-2	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

SIGMA-ALDRICH

Material Safety Data Sheet

Version 3.1
Revision Date 01/09/2009
Print Date 10/29/2010

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : *sec*-Butylbenzene

Product Number : 19620
Brand : Fluka

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA
Telephone : +18003255832
Fax : +18003255052
Emergency Phone # : (314) 776-6555

2. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 2-Phenylbutane

Formula : $C_{10}H_{14}$
Molecular Weight : 134.22 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
sec-Butylbenzene			
135-98-8	205-227-0	-	-

3. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid, Irritant

HMIS Classification
Health Hazard: 2
Flammability: 2
Physical hazards: 0

NFPA Rating
Health Hazard: 2
Fire: 2
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Flammable properties

Flash point	52.0 °C (125.6 °F) - closed cup
Ignition temperature	418 °C (784 °F)

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods for cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-75.5 °C (-103.9 °F)
Boiling point	173 - 174 °C (343 - 345 °F)
Flash point	52.0 °C (125.6 °F) - closed cup
Ignition temperature	418 °C (784 °F)
Lower explosion limit	0.8 %(V)
Density	0.863 g/mL at 25 °C (77 °F)
Water solubility	no data available

10. STABILITY AND REACTIVITY

Storage stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Hazardous reactions
Vapours may form explosive mixture with air.

11. TOXICOLOGICAL INFORMATION

Acute toxicity

LD50 Dermal - rabbit - > 13,792 mg/kg

Irritation and corrosion

Skin - rabbit - Skin irritation - 24 h

Eyes - rabbit - Mild eye irritation - 24 h

Sensitisation

no data available

Chronic exposure

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Signs and Symptoms of Exposure

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.
Ingestion	May be harmful if swallowed.

Additional Information
RTECS: CY9100000

12. ECOLOGICAL INFORMATION

Elimination information (persistence and degradability)

no data available

Ecotoxicity effects

no data available

Further information on ecology

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenes
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant: No

IATA
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid, Irritant

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	1991-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	1991-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
sec-Butylbenzene	135-98-8	1991-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth, or any other reproductive defects.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 12/06/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Pyrene
Product Number	:	185515
Brand	:	Aldrich
Product Use	:	For laboratory research purposes.
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Manufacturer	:	Sigma-Aldrich Corporation 3050 Spruce St. St. Louis, Missouri 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Carcinogen

Target Organs

Liver, Blood, Kidney

Other hazards which do not result in classification
Rapidly absorbed through skin.

GHS Classification
Acute toxicity, Oral (Category 5)
Skin irritation (Category 3)
Eye irritation (Category 2B)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 4)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H303	May be harmful if swallowed.
H316	Causes mild skin irritation.
H320	Causes eye irritation.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if

present and easy to do. Continue rinsing.

HMIS Classification

Health hazard: 1
Chronic Health Hazard: *
Flammability: 1
Physical hazards: 0

NFPA Rating

Health hazard: 0
Fire: 1
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : Benzo[*def*]phenanthrene

Formula : $C_{16}H_{10}$
Molecular Weight : 202.25 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Pyrene			
129-00-0	204-927-3	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Pyrene	129-00-0	TWA	0.2 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	0.2 mg/m3	2007-01-01	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
For nuisance exposures use type P95 (US) or type P1 (EU EN 143) particle respirator.For higher level protection use type OV/AG/P99 (US) or type ABEK-P2 (EU EN 143) respirator cartridges. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	crystalline
Colour	yellow

Safety data

pH	no data available
Melting/freezing point	Melting point/range: 145 - 148 °C (293 - 298 °F) - lit.
Boiling point	390.0 - 395.0 °C (734.0 - 743.0 °F)
Flash point	> 200.0 °C (> 392.0 °F)
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	1.21 g/cm3
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 4.88
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 2,700 mg/kg
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Conjunctive irritation. Behavioral:Excitement. Behavioral:Muscle contraction or spasticity.

Inhalation LC50
LC50 Inhalation - rat - 170.0 mg/m3
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Conjunctive irritation. Behavioral:Excitement. Behavioral:Muscle contraction or spasticity.

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Pyrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Known to be human carcinogen (Pyrene)
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Inhalation studies in animals have caused:, Liver toxicity, pulmonary pathologies, intragastric pathologies, neutropenia, leukopenia, anemia, Contact with skin can cause:, hyperemia, weight loss, hematopoietic changes, Dermatitis, Chronic effects, leukocytosis

Synergistic effects

no data available

Additional Information
RTECS: UR2450000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - > 2 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 0.002 - 0.003 mg/l - 48 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	other fish - 48 h Bioconcentration factor (BCF): 4,810

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

Very toxic to aquatic life.

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Pyrene)
Marine pollutant: Marine pollutant

IATA
UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Pyrene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
Carcinogen

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2007-03-01

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2007-03-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Pyrene	129-00-0	1990-01-01

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS Safety Information

TOP

FSC: 6810 **MSDS Date:** 03/23/1988 **MSDS Num:** BQYZZ

Submitter: F BT **LIIN:** 00F027073 **Tech Review:** 04/16/1993 **Status CD:** C

Product ID: 0403693 PHENOL,LIQUIFIED **MFN:** 01

Article: N **Kit Part:** N

Responsible Party **Cage:** 63612

Name: E M SCIENCE DIV OF E M IND INC

Address: 111 WOODCREST ROAD **Box:** N/K

City: CHERRY HILL **State:** NJ **Zip:** 08034−0395

Country: US

Info Phone Number: 513−631−0445

Emergency Phone Number: 800−424−9300

Preparer's Name: N/P

Proprietary Ind: N Review Ind: Y

Published: Y Special Project CD: N

Preparer Co. when other than Responsible Party Co.

TOP

Cage: 63612 **Assigned Ind:** N

Name: E M SCIENCE DIV OF E M INDUSTRIES INC

Address: 480 DEMOCRAT ROAD **Box:** 70

City: GIBBSTOWN **State:** NJ **Zip:** 08027

Contractor Summary

TOP

Cage: 15481 **Name:** CURTIN MATHESON SCIENTIFIC INC

Address: 9999 VETERANS MEMORIAL DR **Box:** 1546

City: HOUSTON **State:** TX **Zip:** 77038−2499

Country: US **Phone:** 713−820−9898

Cage: 63612 **Name:** E M SCIENCE DIV OF E M INDUSTRIES INC

Address: 480 DEMOCRAT ROAD **Box:** 70

City: GIBBSTOWN **State:** NJ **Zip:** 08027

Country: US **Phone:** 800−222−0342/609−423−6300

Ingredients

TOP

Cas: 108−95−2 Code: M RTECS #: SJ3325000 Code: M

Name: **PHENOL, CARBOLIC ACID SOLUTION; HYDROXYBENZENE**

% Text: 100 Environmental Wt:

Other REC Limits: 5 MG/CUM

OSHA PEL:	19 MG/CUM	Code: M	OSHA STEL:		Code:
ACGIH TLV:	19 MG/CUM (SKIN)	Code: M	ACGIH STEL:	N/P	Code:
EPA Rpt Qty:	1000 LBS		DOT Rpt Qty:	1000 LBS	

Ozone Depleting Chemical: N

========== Health Hazards Data ==========

TOP

LD50 LC50 Mixture N/K

Route Of Entry Inds − Inhalation:YES	Skin:YES	Ingestion:YES
Carcinogenicity Inds − NTP:NO	IARC:NO	OSHA:NO

Health Hazards Acute And Chronic

INHALATION: TOXIC, BURNS, HEADACHE, DIZZINESS, MUSCLE WEAKNESS. EYES/SKIN/INGESTION: TOXIC & BURNS.

Explanation Of Carcinogenicity

NONE

Signs And Symptions Of Overexposure

INHALATION: CONVULSIONS, DEATH, DAMAGE TO CENTRAL NERVOUS SYSTEM, KIDNEYS, LIVER, PANCREAS, HEART, SPLEEN, & LUNGS.

Medical Cond Aggravated By Exposure

LIVER, KIDNEY, CENTRAL NERVOUS SYSTEM, RESPIRATORY, PANCREATIC & CIRCULATORY CONDITIONS

First Aid

SKIN: IMMEDIATELY FLUSH THOROUGHLY W/LARGE AMOUNTS OF WATER. EYES: IMMEDIATELY FLUSH THOROUGHLY W/WATER FOR AT LEAST 15 MINS. INHALATION: REMOVE TO FRESH AIR. GIVE ARTIFICIAL RESPIRATION IF BREATHING HAS STOPPED. INGESTION: DON'T INDUCE VOMITING. OBTAIN MEDICAL ATTENTION IN ALL CASES.

Spill Release Procedures

SPILL RESPONSE: USE CAUTION DIKE SPILL, TAKE UP W/ABSORBENT & CONTAINERIZE FOR PROPER DISPOSAL.

Neutralizing Agent

N/K

Waste Disposal Methods

TO BE PERFORMED IN COMPLIANCE W/ALL CURRENT LOCAL, STATE, & FEDERAL REGULATIONS. NA2821.

Handling And Storage Precautions

KEEP CONTAINER TIGHTLY CLOSED & PROTECT AGAINST PHYSICAL DAMAGE. STORE IN COOL/DRY AREA AWAY FROM IGNITION SOURCES & OXIDIZERS.

Other Precautions

DON'T BREATHE VAPOR. DON'T GET IN EYES, ON SKIN, OR ON CLOTHING. RETAINED RESIDUE MAY MAKE EMPTY CONTAINERS HAZARDOUS; USE CAUTION. DON'T TAKE INTERNALLY. ALUMINUM/MAGNESIUM/LEAD/ZINC ARE QUICKLY ATTA CKED BY HOT PHENOL.

Fire and Explosion Hazard Information

TOP

Flash Point Method: CC

Flash Point:

Flash Point Text: 175F

Autoignition Temp:

Autoignition Temp Text: N/A

Lower Limits: 1.8%

Upper Limits: 8.6%

Extinguishing Media

CO2, DRY CHEMICAL, FOAM, WATER SPRAY

Fire Fighting Procedures

WEAR SELF−CONTAINED BREATHING APPARATUS & PROTECTIVE CLOTHING.

Unusual Fire/Explosion Hazard

DANGEROUS FIRE & EXPLOSION HAZARD.

Control Measures

TOP

Respiratory Protection

NIOSH APPROVED RESPIRATOR SHOULD BE WORN IN THE ABSENCE OF ADEQUATE VENTILATION.

Ventilation

MATERIAL MUST BE HANDLED OR TRANSFERRED IN AN APPROVED FUME HOOD OR W/EQUIVALENT VENTILATION.

Protective Gloves

NEOPRENE OR EQUIVALENT

Eye Protection

SAFETY GLASSES W/SIDE SHIELDS

Other Protective Equipment

IMPERVIOUS PROTECTIVE CLOTHING, EYE WASH, &SAFETY EQUIPMENT

Work Hygienic Practices

REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE. WASH THOROUGHLY AFTER HANDLING.

Supplemental Safety and Health

N/K

Physical/Chemical Properties

TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point:

B.P. Text: 182C

Melt/Freeze Pt: M.P/F.P Text: N/K
Decomp Temp: Decomp Text: N/K

Vapor Pres: N/K Vapor Density: 3.2
Volatile Org Content %: Spec Gravity: 1.05

VOC Pounds/Gallon: PH: N/K
VOC Grams/Liter: Viscosity: N/P

Evaporation Rate & Reference: N/K
Solubility in Water: MISCIBLE
Appearance and Odor: COLORLESS TO PINK LIQUID, SHARP MEDICINAL ODOR.

Percent Volatiles by Volume: 100% Corrosion Rate: N/K

========== Reactivity Data ========== TOP

Stability Indicator: YES

Stability Condition To Avoid: HEAT >100F (MATERIAL DISCOLORS) &OTHER SOURCES OF IGNITION
Materials To Avoid: ACIDS, OXIDIZERS, CALCIUM HYPOCHLORITE, ALKALIES, &ACETALDEHYDE
Hazardous Decomposition Products: CO, CO2

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization N/K

:

========== Toxicological Information ========== TOP

Toxicological Information: N/P

========== Ecological Information ========== TOP

Ecological: N/P

========== MSDS Transport Information ========== TOP

Transport Information: N/P

========== Regulatory Information ========== TOP

Sara Title III Information: N/P

Federal Regulatory Information: N/P
State Regulatory Information: N/P

========== Other Information ========== TOP

Other Information: N/P

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Material Safety Data Sheet

Version 4.0
Revision Date 07/24/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Phenanthrene
Product Number	:	P11409
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Harmful by ingestion., Irritant

Other hazards which do not result in classification
Photosensitizer.

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H302	Harmful if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H335	May cause respiratory irritation.
H400	Very toxic to aquatic life.
H413	May cause long lasting harmful effects to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification

Health hazard:	2
Flammability:	0
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Skin	May be harmful if absorbed through skin. Causes skin irritation.

Eyes	Causes eye irritation.
Ingestion	Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{14}H_{10}$
Molecular Weight : 178.23 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Phenanthrene			
85-01-8	201-581-5	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Handle and store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control	Update	Basis

			parameters		
Phenanthrene	85-01-8	TWA	0.2 mg/m3	1993-06-30	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.2 mg/m3	1989-03-01	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a dust mask type N95 (US) or type P1 (EN 143) respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses with side-shields conforming to EN166

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	98 - 100 °C (208 - 212 °F)
Boiling point	340 °C (644 °F)
Flash point	no data available
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	1.063 g/mL at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 4.57

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - mouse - 700.0 mg/kg

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
Causes photosensitivity. Exposure to light can result in allergic reactions resulting in dermatologic lesions, which can vary from sunburnlike responses to edematous, vesiculated lesions, or bullae

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Phenanthrene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
Inhalation - May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	Harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 3.2 mg/l - 96.0 h
	LC100 - other fish - 1.5 mg/l - 1.0 h
Toxicity to daphnia	EC50 - Daphnia magna (Water flea) - 0.86 mg/l - 24 h

and other aquatic invertebrates.

EC50 - Daphnia magna (Water flea) - 0.38 mg/l - 48 h

Toxicity to algae EC50 - Chlorella vulgaris (Fresh water algae) - 1.20 mg/l - 3 h

Persistence and degradability

Biodegradability Result: 55 - 95 % - Partially biodegradable.

Bioaccumulative potential

Bioaccumulation Pimephales promelas (fathead minnow) - 28 d
Bioconcentration factor (BCF): 5,100

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms.

13. DISPOSAL CONSIDERATIONS

Product

Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Phenanthrene)
Reportable Quantity (RQ): 5000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG

UN-Number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Phenanthrene)
Marine pollutant: No

IATA

UN-Number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Phenanthrene)

Further information

EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards

Harmful by ingestion., Irritant

DSL Status

All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

SARA 311/312 Hazards
Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Phenanthrene	85-01-8	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Phenanthrene	85-01-8	1990-01-01

16. OTHER INFORMATION

Further information
Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

GARDENA, CA
NEW BRUNSWICK, NJ

Material Safety Data Sheet

NFPA	HMIS	Personal Protective Equipment
	Health Hazard 3 Fire Hazard 0 Reactivity 0	See Section 15.

Section 1. Chemical Product and Company Identification

Common Name/ Trade Name	**Pentachlorophenol**	**Catalog Number(s).**	P2124, P1011
		CAS#	87-86-5
Manufacturer	SPECTRUM CHEMICAL MFG. CORP. 14422 S. SAN PEDRO STREET GARDENA, CA 90248	**RTECS**	SM6300000
		TSCA	TSCA 8(b) inventory: Pentachlorophenol
Commercial Name(s)	Not available.	**CI#**	Not available.
Synonym	Not available.	**IN CASE OF EMERGENCY CHEMTREC (24hr) 800-424-9300**	
Chemical Name	Not available.	CALL (310) 516-8000	
Chemical Family	Not available.		
Chemical Formula	C6Cl5OH		
Supplier	SPECTRUM CHEMICAL MFG. CORP. 14422 S. SAN PEDRO STREET GARDENA, CA 90248		

Section 2.Composition and Information on Ingredients

		Exposure Limits			
Name	**CAS #**	**TWA (mg/m^3)**	**STEL (mg/m^3)**	**CEIL (mg/m^3)**	**% by Weight**
1) Pentachlorophenol	87-86-5	0.5			100

Toxicological Data on Ingredients

Pentachlorophenol:
ORAL (LD50): Acute: 27 mg/kg [Rat]. 117 mg/kg [Mouse].
VAPOR (LC50): Acute: 502 ppm 4 hour(s) [Rat].

Section 3. Hazards Identification

Potential Acute Health Effects

Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of inhalation. Slightly hazardous in case of skin contact (corrosive, sensitizer). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Continued on Next Page

Potential Chronic Health Effects	**CARCINOGENIC EFFECTS**: Not available. **MUTAGENIC EFFECTS**: Not available. **TERATOGENIC EFFECTS**: Not available. **DEVELOPMENTAL TOXICITY**: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4. First Aid Measures

Eye Contact	Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.
Skin Contact	After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention.
Serious Skin Contact	Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.
Inhalation	Allow the victim to rest in a well ventilated area. Seek immediate medical attention.
Serious Inhalation	Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.
Ingestion	Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.
Serious Ingestion	Not available.

Section 5. Fire and Explosion Data

Flammability of the Product	Non-flammable.
Auto-Ignition Temperature	Not applicable.
Flash Points	Not applicable.
Flammable Limits	Not applicable.
Products of Combustion	Not available.
Fire Hazards in Presence of Various Substances	Not applicable.
Explosion Hazards in Presence of Various Substances	Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.
Fire Fighting Media and Instructions	Not applicable.
Special Remarks on Fire Hazards	Not available.
Special Remarks on Explosion Hazards	Not available.

Continued on Next Page

Section 6. Accidental Release Measures

Small Spill	Use appropriate tools to put the spilled solid in a convenient waste disposal container.
Large Spill	Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7. Handling and Storage

Precautions	Keep locked up Keep container dry. Do not ingest. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes
Storage	Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8. Exposure Controls/Personal Protection

Engineering Controls	Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.
Personal Protection	Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.
Personal Protection in Case of a Large Spill	Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.
Exposure Limits	TWA: 0.5 (mg/m^3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9. Physical and Chemical Properties

Physical state and appearance	Solid.	**Odor**	Pungent. (Strong.)
Molecular Weight	266.34 g/mole	**Taste**	Not available.
pH (1% soln/water)	Not available.	**Color**	White.

Boiling Point	Decomposes. (310°C or 590°F)
Melting Point	188°C (370.4°F)
Critical Temperature	Not available.
Specific Gravity	1.987 (Water = 1)
Vapor Pressure	Not applicable.
Vapor Density	9.2 (Air = 1)
Volatility	Not available.
Odor Threshold	Not available.
Water/Oil Dist. Coeff.	Not available.
Ionicity (in Water)	Not available.
Dispersion Properties	Not available.
Solubility	Very slightly soluble in cold water.

Continued on Next Page

Section 10. Stability and Reactivity Data

Stability	The product is stable.
Instability Temperature	Not available.
Conditions of Instability	Not available.
Incompatibility with various substances	Not available.
Corrosivity	Non-corrosive in presence of glass.
Special Remarks on Reactivity	Not available.
Special Remarks on Corrosivity	Not available.
Polymerization	No.

Section 11. Toxicological Information

Routes of Entry	Dermal contact. Eye contact. Inhalation. Ingestion.
Toxicity to Animals	**WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE.** Acute oral toxicity (LD50): 27 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 502 ppm 4 hour(s) [Rat].
Chronic Effects on Humans	The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes.
Other Toxic Effects on Humans	Very hazardous in case of skin contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of inhalation. Slightly hazardous in case of skin contact (corrosive, sensitizer).
Special Remarks on Toxicity to Animals	Not available.
Special Remarks on Chronic Effects on Humans	Not available.
Special Remarks on other Toxic Effects on Humans	Not available.

Section 12. Ecological Information

Ecotoxicity	Not available.
BOD5 and COD	Not available.
Products of Biodegradation	Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.
Toxicity of the Products of Biodegradation	The products of degradation are more toxic.
Special Remarks on the Products of Biodegradation	Not available.

Continued on Next Page

Section 13. Disposal Considerations

Waste Disposal

Section 14. Transport Information

DOT Classification	CLASS 6.1: Poisonous material.
Identification	: Chlorophenol, solid : UN2020 PG: III
Special Provisions for Transport	Marine Pollutant
DOT (Pictograms)	

Section 15. Other Regulatory Information and Pictograms

Federal and State Regulations	California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Pentachlorophenol California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Pentachlorophenol Pennsylvania RTK: Pentachlorophenol Massachusetts RTK: Pentachlorophenol TSCA 8(b) inventory: Pentachlorophenol SARA 313 toxic chemical notification and release reporting: Pentachlorophenol
California Proposition 65 Warnings	California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Pentachlorophenol
Other Regulations	OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).
Other Classifications	**WHMIS (Canada)**: CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).
	DSCL (EEC): R38- Irritating to skin. R41- Risk of serious damage to eyes. R48/20- Harmful: danger of serious damage to health by prolonged exposure through inhalation. R48/25- Toxic: danger of serious damage to health in case of prolonged exposure if swallowed.

HMIS (U.S.A.)

Health Hazard	3
Fire Hazard	0
Reactivity	0
Personal Protection	E

National Fire Protection Association (U.S.A.)

Health

Flammability

Reactivity

Specific hazard

WHMIS (Canada) (Pictograms)

Continued on Next Page

DSCL (Europe) (Pictograms)

TDG (Canada) (Pictograms)

ADR (Europe) (Pictograms)

Protective Equipment

Gloves.

Lab coat.

Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16. Other Information

MSDS Code	**P3190**
References	Not available.
Other Special Considerations	Not available.

Validated by Sonia Owen on 8/11/2006.	**Verified by Sonia Owen.** **Printed 9/13/2006.**

CALL (310) 516-8000

Notice to Reader

All chemicals may pose unknown hazards and should be used with caution. This Material Safety Data Sheet (MSDS) applies only to the material as packaged. If this product is combined with other materials, deteriorates, or becomes contaminated, it may pose hazards not mentioned in this MSDS. It shall be the user's responsibility to develop proper methods of handling and personal protection based on the actual conditions of use. While this MSDS is based on technical data judged to be reliable, Spectrum Quality Products, Inc. assumes no responsibility for the completeness or accuracy of the information contained herein.

Material Safety Data Sheet

p−Cresol

ACC# 17610

Section 1 − Chemical Product and Company Identification

MSDS Name: p−Cresol
Catalog Numbers: AC110590000, AC110590050, AC110591000, AC110595000, AC405740000, AC405740040 AC405740040, AC405740050, AC405741000, AC405745000
Synonyms: 4−Cresol; p−Cresylic Acid; 1−Hydroxy−4−Methylbenzene; p−Hydroxytoluene; 4−Hydroxytoluene; p−Methylphenol.
Company Identification:
Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410
For information in North America, call: 800−ACROS−01
For emergencies in the US, call CHEMTREC: 800−424−9300

Section 2 − Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
106−44−5	p−Cresol	>98	203−398−6

Section 3 − Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless to light yellow solid. Flash Point: 187 deg F.
Danger! Toxic. Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract burns. May be fatal if inhaled. Harmful if swallowed or absorbed through the skin. May cause liver and kidney damage. Hygroscopic (absorbs moisture from the air). Light sensitive. Material is a solid at room temperature that melts upon moderate heating into a combustible liquid with a flash point below 200°F(93.3°C). May cause sensitization by skin contact.
Target Organs: Kidneys, central nervous system, liver, respiratory system.

Potential Health Effects

Eye: Causes eye burns. May result in corneal injury. Contact with liquid is corrosive to the eyes and causes severe burns. May cause conjunctivitis and keratitis.
Skin: May be absorbed through the skin in harmful amounts. Causes severe skin irritation and burns. May cause sensitization by skin contact. Initial contact may cause prickling and intense burning. Affected tissue may initially show white discoloration, wrinkling, and softening, which subsequently may become gangrenous.
Ingestion: May cause severe and permanent damage to the digestive tract. May cause vascular collapse and damage. Causes severe digestive tract burns with abdominal pain, vomiting, and possible death. May cause kidney, liver and spleen damage. Rapidly absorbed from the gastrointestinal tract. Cresols may cause abnormalities of the central nervous system, respiratory system, spleen and pancreas.
Inhalation: May be fatal if inhaled. Irritation may lead to chemical pneumonitis and pulmonary edema. May cause liver and kidney damage. Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. Causes chemical burns to the respiratory tract. May cause headache. May cause nausea and possible vomiting. Exposure to vapors or aerosols produced by high temperature processes may cause systemic absorption. If sufficient amounts are absorbed vascular collapse, shock, hypthermia, unconciousness and respiratory failure are possible.
Chronic: May cause liver and kidney damage. Repeated exposure may cause sensitization dermatitis. May cause appetite loss, diarrhea, skin abnormalities, and digestive tract disturbances.

Section 4 − First Aid Measures

Eyes: Get medical aid immediately. Do NOT allow victim to rub eyes or keep eyes closed. Extensive irrigation with water is required (at least 30 minutes).
Skin: Get medical aid immediately. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Discard contaminated clothing in a manner which limits further exposure. Destroy contaminated shoes.
Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2−4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.
Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Do NOT use mouth−to−mouth resuscitation. If breathing has ceased apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask.
Notes to Physician: Treat symptomatically and supportively.

Section 5 − Fire Fighting Measures

General Information: As in any fire, wear a self−contained breathing apparatus in pressure−demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors can travel to a source of ignition and flash back. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. May polymerize explosively when involved in a fire. Material is a solid at room temperature that melts upon moderate heating into a combustible liquid with a flash point below 200°F(93.3°C).
Extinguishing Media: For small fires, use dry chemical, carbon dioxide, or water spray. For large fires, use dry chemical, carbon dioxide, alcohol−resistant foam, or water

spray.
Flash Point: 187e deg F (86.11 deg C)
Autoignition Temperature: 1038 deg F (558.89 deg C)
Explosion Limits, Lower:1.1% @ 150C
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 − Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Provide ventilation. Evacuate unnecessary personnel.

Section 7 − Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well−ventilated area. Minimize dust generation and accumulation. Ground and bond containers when transferring material. Do not get in eyes, on skin, or on clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Do not ingest or inhale. Discard contaminated shoes. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from sources of ignition. Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well−ventilated area away from incompatible substances. Corrosives area. If the water content is below approximately 0.3% and the temperature exceeds 268°F (120°C), violent corrosion of aluminum and its alloys may occur.

Section 8 − Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation to keep airborne concentrations low.
Exposure Limits

Chemical Name	*ACGIH*	*NIOSH*	*OSHA − Final PELs*
p−Cresol	5 ppm TWA; Skin − potential significant contribution to overall exposure by the cutaneous r oute	2.3 ppm TWA; 10 mg/m3 TWA 250 ppm IDLH	none listed

OSHA Vacated PELs: p−Cresol: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 − Physical and Chemical Properties

Physical State: Solid
Appearance: colorless to light yellow
Odor: phenol−like
pH: Not available.
Vapor Pressure: 1 mm Hg @ 53C
Vapor Density: 3.72 (air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 396 deg F
Freezing/Melting Point:35 deg C
Decomposition Temperature: Not available.
Solubility: 22.6g/L @ 40C.
Specific Gravity/Density:1.03 (water=1)
Molecular Formula:C7H8O
Molecular Weight:108.0554

Section 10 − Stability and Reactivity

Chemical Stability: Stable at room temperature in closed containers under normal storage and handling conditions. Low melting point solid.
Conditions to Avoid: Incompatible materials, light, ignition sources, excess heat.
Incompatibilities with Other Materials: Oxidizing agents, strong acids, bases, active metals, coatings, nitric acid, plastics, rubber, aliphatic amines, amides, chlorosulfonic acid, oleum, alkalies.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, cresol.
Hazardous Polymerization: Has not been reported.

Section 11 − Toxicological Information

RTECS#:
CAS# 106−44−5: GO6475000
LD50/LC50:
CAS# 106−44−5:
Draize test, rabbit, eye: 103 mg Severe;
Draize test, rabbit, skin: 517 mg/24H Severe;
Inhalation, rat: LC50 = >710 mg/m3/1H;
Inhalation, rat: LC50 = 29 mg/m3;
Oral, mouse: LD50 = 344 mg/kg;
Oral, mouse: LD50 = 160 mg/kg;
Oral, rabbit: LD50 = 620 mg/kg;
Oral, rat: LD50 = 207 mg/kg;
Oral, rat: LD50 = 270 mg/kg;
Skin, rabbit: LD50 = 301 mg/kg;
Skin, rabbit: LD50 = 301 mg/kg;
Skin, rat: LD50 = 750 mg/kg;
Skin, rat: LD50 = 750 mg/kg;
Carcinogenicity:
CAS# 106−44−5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found.
Teratogenicity: No information available.
Reproductive Effects: No information found.
Mutagenicity: No information available.
Neurotoxicity: No information found.
Other Studies:

Section 12 − Ecological Information

Ecotoxicity: Fish: Fathead Minnow: LC50 = 19−28.6 mg/L; 96 Hr.; UnspecifiedFish: LC50 = 19−28.6 mg/L; 96 Hr.; UnspecifiedBacteria: Phytobacterium phosphoreum: EC50 = 1.6 mg/L; 15 Minutes; Microtox test Goldfish (soft water) TLm=49.1−19ppm/24−96H Bluegill (soft water) TLm=22.2−20.8ppm/24−96H Fathead minnow (hard water) TLm=18−13.4ppm/24−96H Guppy (hard water) TLm=18−50ppm/24−96H
Environmental: In air, substance will react with photochemically−produced hydroxyl radicals (day) and nitrate radicals (night). In water, substance will biodegrade within days. Substance is mobile in most soils and will biodegrade.
Physical: No information available.
Other: Please refer to the Handbook of Environmental Fate and Exposure Data (Vol 1) for additional information.

Section 13 − Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P−Series: None listed.
RCRA U−Series: None listed.

Section 14 − Transport Information

	US DOT	***Canada TDG***
Shipping Name:	CRESOLS, SOLID	CRESOLS
Hazard Class:	6.1	6.1(8)
UN Number:	UN2076	UN2076
Packing Group:	II	II

Section 15 − Regulatory Information

US FEDERAL

TSCA
CAS# 106−44−5 is listed on the TSCA inventory.
Health &Safety Reporting List
CAS# 106−44−5: Effective 10/4/82, Sunset 10/4/92
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 106−44−5: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 106−44−5: acute, flammable.
Section 313
This material contains p−Cresol (CAS# 106−44−5, >98%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 106−44−5 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 106−44−5 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

CAS# 106−44−5 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T C

Risk Phrases:

R 34 Causes burns.
R 24/25 Toxic in contact with skin and if swallowed.

Safety Phrases:

S 36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 106−44−5: 2

Canada − DSL/NDSL

CAS# 106−44−5 is listed on Canada's DSL List.

Canada − WHMIS

This product has a WHMIS classification of B3, D1A, E.

Canadian Ingredient Disclosure List

CAS# 106−44−5 is listed on the Canadian Ingredient Disclosure List.

Section 16 − Additional Information

MSDS Creation Date: 5/05/1999
Revision #5 Date: 2/01/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

Date Printed: 05/16/2006
Date Updated: 02/05/2006
Version 1.7

Section 1 - Product and Company Information

Product Name	TETRACHLOROETHENE
Product Number	46260
Brand	RIEDEL
Company	Sigma-Aldrich
Address	3050 Spruce Street SAINT LOUIS MO 63103 US
Technical Phone:	800-325-5832
Fax:	800-325-5052
Emergency Phone:	314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name	CAS #	SARA 313
TETRACHLOROETHYLENE	127-18-4	Yes

Formula C2Cl4

Synonyms Ankilostin * Antisol 1 * Carbon bichloride * Carbon dichloride * Czterochloroetylen (Polish) * Didakene * Dilatin PT * Dow-per * ENT 1,860 * Ethene, tetrachloro- * Ethylene tetrachloride * Fedal-UN * NCI-C04580 * PER * Perawin * Perchloorethyleen, per (Dutch) * Perchlor * Perchloraethylen, per (German) * Perchlorethylene * Perchloroethylene (ACGIH:OSHA) * Perclene * Perclene D * Percloroetilene (Italian) * Percosolve * PERK * Perklone * Persec * RCRA waste number U210 * Tetlen * Tetracap * Tetrachlooretheen (Dutch) * Tetrachloraethen (German) * Tetrachlorethylene * Tetrachloroethene * Tetrachloroethylene (IUPAC) * 1,1,2,2-Tetrachloroethylene * Tetrachloroethylene (DOT:OSHA) * Tetracloroetene (Italian) * Tetraleno * Tetralex * Tetravec * Tetroguer * Tetropil

RTECS Number: KX3850000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Toxic. Dangerous for the environment.
Irritating to eyes, respiratory system and skin. Toxic to aquatic organisms. May cause cancer.
Target organ(s): Liver. Kidneys. Calif. Prop. 65 carcinogen.

HMIS RATING

HEALTH: 0*
FLAMMABILITY: 0
REACTIVITY: 0

NFPA RATING

HEALTH: 0
FLAMMABILITY: 0
REACTIVITY: 0

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Water spray. Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Emits toxic fumes under fire conditions.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves. Wear disposable coveralls and discard them after use.

METHODS FOR CLEANING UP
Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed.
Store at 2-8°C

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash contaminated clothing before reuse. Wash thoroughly after handling.

EXPOSURE LIMITS, RTECS

Country	Source	Type	Value
USA	ACGIH	STEL	100 PPM
USA	ACGIH	TWA	25 PPM
USA	MSHA Standard-air	TWA	100 PPM (670 MG/M3)
USA	OSHA.	PEL	8H TWA 100 PPM;CL 200;PK 300/5
USA	NIOSH		LOWEST FEASIBLE CONC.

EXPOSURE LIMITS

Country	Source	Type	Value
Poland		NDS	60 MG/M3
Poland		NDSCh	480 MG/M3
Poland		NDSP	-

Section 9 - Physical/Chemical Properties

Appearance: Physical State: Clear liquid
Color: Colorless

Property	Value	At Temperature or Pressure
Molecular Weight	165.83 AMU	
pH	N/A	
BP/BP Range	120.0 - 122.0 °C	
MP/MP Range	- 22.0 °C	
Freezing Point	N/A	
Vapor Pressure	13 mmHg	20 °C
Vapor Density	5.83 g/l	
Saturated Vapor Conc.	N/A	
SG/Density	1.622 g/cm3	
Bulk Density	N/A	
Odor Threshold	N/A	

Volatile%	N/A
VOC Content	N/A
Water Content	N/A
Solvent Content	N/A
Evaporation Rate	N/A
Viscosity	N/A
Surface Tension	N/A
Partition Coefficient	N/A Log Kow: 3.4
Decomposition Temp.	N/A
Flash Point	N/A
Explosion Limits	N/A
Flammability	N/A
Autoignition Temp	N/A
Refractive Index	1.506
Optical Rotation	N/A
Miscellaneous Data	N/A
Solubility	N/A

N/A = not available

Section 10 - Stability and Reactivity

STABILITY
Stable: Stable.
Materials to Avoid: Strong oxidizing agents, Strong bases.

HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide, Hydrogen chloride gas.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Nerves. Heart. Liver. Kidneys.

SIGNS AND SYMPTOMS OF EXPOSURE
Damage to the kidneys. Damage to the liver. Narcotic effect.
Exposure can cause:

TOXICITY DATA

Oral
Rat
2629 mg/kg
LD50

Inhalation
Rat
34,200 mg/m3
LC50

Intraperitoneal
Rat
4678 MG/KG
LD50

Oral
Mouse
8100 mg/kg
LD50
Remarks: Behavioral:General anesthetic.

Inhalation
Mouse
5,200 ppm
LC50

Subcutaneous
Mouse
65 GM/KG
LD50
Remarks: Behavioral:Ataxia. Behavioral:Sleep.

Intraperitoneal
Dog
2100 MG/KG
LD50
Remarks: Liver:Liver function tests impaired.

IRRITATION DATA

Skin
Rabbit
810 mg
24H
Remarks: Severe irritation effect

Skin
Rabbit
500 mg
24H
Remarks: Mild irritation effect

Eyes
Rabbit
162 mg
Remarks: Mild irritation effect

Eyes
Rabbit
500 mg
24H
Remarks: Mild irritation effect

CHRONIC EXPOSURE - CARCINOGEN
Result: This is or contains a component that has been reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Inhalation
Dose: 200 PPM
Exposure Time: 6H/2Y

Frequency: I
Result: Blood:Leukemia Tumorigenic:Carcinogenic by RTECS criteria. Tumorigenic Effects: Testicular tumors.

Species: Mouse
Route of Application: Oral
Dose: 195 GM/KG
Exposure Time: 50W
Frequency: I
Result: Liver:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Inhalation
Dose: 100 PPM
Exposure Time: 6H/2Y
Frequency: I
Result: Liver:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Mouse
Route of Application: Oral
Dose: 240 GM/KG
Exposure Time: 62W
Frequency: I
Result: Liver:Tumors. Tumorigenic:Carcinogenic by RTECS criteria.

Species: Rat
Route of Application: Inhalation
Dose: 200 PPM
Exposure Time: 6H/2Y
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Kidney, Ureter, Bladder:Kidney tumors. Blood:Leukemia

Species: Mouse
Route of Application: Inhalation
Dose: 100 PPM
Exposure Time: 6H/2Y
Frequency: I
Result: Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.

IARC CARCINOGEN LIST

Rating: Group 2A

NTP CARCINOGEN LIST

Rating: Clear evidence.
Species: Mouse
Route: Gavage

CHRONIC EXPOSURE - TERATOGEN

Species: Rat
Dose: 1000 PPM/24H
Route of Application: Inhalation
Exposure Time: (14D PRE/1-22D PREG)
Result: Specific Developmental Abnormalities: Musculoskeletal system.

Species: Rat
Dose: 1000 PPM/24H
Route of Application: Inhalation

Exposure Time: (1-22D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

Species: Mouse
Dose: 300 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus). Specific Developmental Abnormalities: Musculoskeletal system. Specific Developmental Abnormalities: Homeostasis

CHRONIC EXPOSURE - MUTAGEN

Species: Human
Dose: 100 MG/L
Cell Type: lung
Mutation test: Unscheduled DNA synthesis

Species: Rat
Dose: 97 UMOL/L
Cell Type: Embryo
Mutation test: Morphological transformation.

Species: Rat
Route: Inhalation
Dose: 500 PPM
Mutation test: Cytogenetic analysis

Species: Mouse
Route: Intraperitoneal
Dose: 4 MMOL/KG
Mutation test: DNA damage

Species: Mouse
Route: Oral
Dose: 1 GM/KG
Mutation test: Other mutation test systems

Species: Mouse
Dose: 100 PPM
Cell Type: S. typhimurium
Mutation test: Host-mediated assay

Species: Mouse
Route: Inhalation
Dose: 500 PPM
Mutation test: sperm

Species: Hamster
Dose: 190 UMOL/L
Cell Type: lung
Mutation test: SLN

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Rat
Dose: 900 PPM/7H
Route of Application: Inhalation
Exposure Time: (7-13D PREG)
Result: Effects on Newborn: Behavioral. Effects on Newborn:

Biochemical and metabolic. Effects on Newborn: Live birth index (# fetuses per litter; measured after birth).

Species: Rat
Dose: 300 PPM/7H
Route of Application: Inhalation
Exposure Time: (6-15D PREG)
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Species: Rat
Dose: 1000 PPM/6H
Route of Application: Inhalation
Exposure Time: (MULTIGENERATION)
Result: Effects on Newborn: Growth statistics (e.g., reduced weight gain). Effects on Newborn: Live birth index (# fetuses per litter; measured after birth). Effects on Newborn: Viability index (e.g., # alive at day 4 per # born alive).

Species: Mouse
Dose: 500 PPM/7H
Route of Application: Inhalation
Exposure Time: (5D MALE)
Result: Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).

Section 12 - Ecological Information

No data available.

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish
Species: Cyprinodon variegatus (Sheepshead minnow)
Time: 96 h
Value: 9.8 mg/l

Test Type: EC50 Daphnia
Species: Daphnia magna
Time: 48 h
Value: 7.5 mg/l

Test Type: LC50 Fish
Species: Lepomis macrochirus (Bluegill)
Time: 96 h
Value: 13 mg/l

Test Type: LC50 Fish
Species: Onchorhynchus mykiss (Rainbow trout)
Time: 96 h
Value: 4.9 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations. (DN)Requires special label: "Contains a substance which is regulated by Dannish work environmental law due to the risk of carcinogenic properties."

Section 14 - Transport Information

DOT
Proper Shipping Name: Tetrachloroethylene
UN#: 1897
Class: 6.1
Packing Group: Packing Group III
Hazard Label: Toxic Substance
PIH: Not PIH

IATA
Proper Shipping Name: Tetrachloroethylene
IATA UN Number: 1897
Hazard Class: 6.1
Packing Group: III

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: Xn-N
Indication of Danger: Harmful. Dangerous for the environment.
R: 40-51/53
Risk Statements: Limited evidence of a carcinogenic effect. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.
S: 23-36/37-61
Safety Statements: Do not breathe vapor. Wear suitable protective clothing and gloves. Avoid release to the environment. Refer to special instructions/safety data sheets.

US CLASSIFICATION AND LABEL TEXT
Indication of Danger: Toxic. Dangerous for the environment.
Risk Statements: Irritating to eyes, respiratory system and skin. Toxic to aquatic organisms. May cause cancer.
Safety Statements: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection.
US Statements: Target organ(s): Liver. Kidneys. Calif. Prop. 65 carcinogen.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
DEMINIMIS: 0.1 %
NOTES: This product is subject to SARA section 313 reporting requirements.
TSCA INVENTORY ITEM: Yes

UNITED STATES - STATE REGULATORY INFORMATION

CALIFORNIA PROP - 65
California Prop - 65: This product is or contains chemical(s) known to the state of California to cause cancer. This product is or contains chemical(s) known to the state of California to cause cancer.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

DISCLAIMER

For R&D use only. Not for drug, household or other uses.

WARRANTY

The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2006 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.

ALGOMA STEEL INC. - Material Safety Evaluation

Product Name: PCB(POLYCHLORINATED BIPHENYLS)	HAZARD RATING	
	Health High	Skin Moderate
Material Type: Transformer, Capacitor Fluid Physical State: Liquid ** REVISED **	Fire Minimal	Reactivity Low

INGREDIENT LISTING

Ingredient	CAS #	%	TWAEV
Polychlorinated Biphenyls **REFER TO ALGOMA PCB MANUAL**	1336-36-3	Var.	.05 mg/m3

TWAEV=time weighted avg. exp. value

mg/m3=mgrams/cubic metre

ppm=parts per million

C=ceiling exposure value

N/A=not applicable

N/E=not established

EFFECTS OF OVEREXPOSURE

Route/Entry	Effects	First Aid
Inhalation	Not a serious hazard at room temperature. Hot fluid may produce vapour which irritates nose & throat.	Remove to fresh air. Call Medical if irritation persists.
Swallowing	May cause irritation to mouth, throat and gastrointestinal system.	Call Medical if necessary.
Eyes	May cause irritation.	Flush with clean water for 15 min. Call Medical if irritation persists.
Skin	May be absorbed through intact skin. May produce irritation, dermatitis, damage to liver & reproductive organs with prolonged/repeated overexposure.	Wash thoroughly with soap and water after handling. Call Medical if irritation persists. Launder contaminated clothing before re-use.

Manufacturer: V A R I O U S

Telephone: ( ) - 0

Prepared by:
Environmental Health & Safety
Feb. 1, 2000.

PHYSICAL DATA

% Volatile by Volume N/E	Solubility in Water N/E	Boiling Point ½C <375
Vapour Pressure (mmHg) N/E	Specific Gravity (H2O=1) 1.44 @ 30 deg C	Melting Point ½C N/A
Vapour Density (air=1) N/E	Evaporation Rate N/A	pH N/A

HANDLING PRECAUTIONS

Flash Point = >140 ½C / >284 ½F Flammable Limits: %LEL N/E
Auto-ignition Temp. = N/E ½C / N/E ½F %UEL N/E
Fire Extinguishing Media:
Use carbon dioxide, dry chemical, foam or sand. Firefighters wear Self Contained Breathing Apparatus.
Explosion Hazards:
None.

Ventilation:
General. Local exhaust in confined spaces or if ventilation inadequate.

Reactivity:
Stable. Thermal decomposition products may include oxides of carbon, hydrogen chloride, phenols and aldehydes.

Storage:
Keep container tightly sealed and away from excess heat & ignition sources. Refer to Algoma Steel PCB Safe Handling Procdures Manual.

Spill Cleanup & Disposal:
Report spills to 3294-3295. Contain spill. Absorb with inert material ie) sand, clay. Do not allow spill to enter environment. Wash area with varsol. See PCB Manual for disposal requirements. Wear proper protective equipment. Use trained personnel for clean-up.

Special:
Avoid inhalation of heated vapour or mist. Avoid skin and eye contact. PCB's are suspected of increasing the risk of contracting cancer with prolonged or repeated overexposure.

PERSONAL PROTECTIVE EQUIPMENT

Respirator:
Use combination organic vapour, mist respirator. In confined spaces or areas of inadequate ventilation, use Self Contained Breathing Apparatus.

Eyes: Use chemical goggles.	Clothes: Disposable coveralls.
Gloves: Solvex.	Special: Wear proper protective equipment to avoid all contact.

Material Safety Data Sheet

Catalog Number: 207935
Revision date: 25-Apr-2006

1. IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND COMPANY INFORMATION

Catalog Number: 207935

Product name: o-CRESOL

Supplier:
MP Biomedicals, LLC
29525 Fountain Parkway
Solon, OH 44139
tel: 440-337-1200

Emergency telephone number: CHEMTREC: 1-800-424-9300 (1-703-527-3887)

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Weight %	ACGIH Exposure Limits:	OSHA Exposure Limits:
o-CRESOL	95-48-7	90 - 100%	5 ppm TWA	None

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Combustible material, Toxic: danger of very serious irreversible effects in contact with skin. May also have serious irreversible effects through inhalation or ingestion.

Category of Danger:
Toxic , Carc. cat. 3 , Lachrymator

Principle routes of exposure: Skin
Inhalation: Harmful: possible risk of irreversible effects through inhalation.
Ingestion: Harmful: danger of serious damage to health if ingested.
Skin contact: Toxic: danger of serious damage to health by prolonged skin contact.
Eye contact: Risk of serious damage to eyes
Vapors extremely irritating to eyes an respiratory tract

ANSI Classification Irritant - eye, severe
Statements of hazard COMBUSTIBLE MATERIAL AND VAPOR.
Toxic in contact with skin
CAUSES EYE IRRITATION.
Statement of Spill or Leak - ANSI Label Eliminate all ignition sources. Absorb and/or contain spill with inert materials (e.g., sand, vermiculite). Then place in appropriate container. For large spills, use water spray to disperse vapors, flush spill area. Prevent runoff from entering waterways or sewers.
Statement of First Aid If swallowed, do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician. In case of contact, flush eyes with running water for at least 15 minutes. Consult a physician for irritation or any other symptom.

Precautions - ANSI Label Do not taste or swallow. Wash thoroughly after handling. Avoid contact with skin, eyes and clothing Keep away from heat, sparks and flame. Keep containers closed. Use only with adequate ventilation. Do not get in eyes, on skin, or on clothing. Wash thoroughly after handling. Do not breathe vapors or spray mist Avoid breathing vapors.

4. FIRST AID MEASURES

General advice: In the case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
Inhalation: Move to fresh air. Call a physician immediately.
Skin contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician Remove and wash contaminated clothing before re-use
Ingestion: Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Consult a physician Drink 1 or 2 glasses of water. Induce vomiting if person is conscious. If swallowed, seek medical advice immediately and show this container or label.
Eye contact: Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Protection of first-aiders: No information available
Medical conditions aggravated by exposure: None known

5. FIRE FIGHTING MEASURES

Suitable extinguishing media:	Use dry chemical, CO2, water spray or `alcohol` foam.
Extinguishing media which must not be used for safety reasons:	Do not use a solid water stream as it may scatter and spread fire.
Specific hazards:	Combustible liquid. Products of combustion include fumes of cresols and other aromatic degradation products. Flammable
Unusual hazards:	None known
Special protective equipment for firefighters:	As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear
Specific methods:	Water mist may be used to cool closed containers.
Flash point:	81 °C (closed cup and DIN 51758)
Autoignition temperature:	555 °C

NFPA rating:

NFPA Health:	3
NFPA Flammability:	2
NFPA Reactivity:	0

6. ACCIDENTAL RELEASE MEASURES

Personal precautions:	Remove all sources of ignition. Use personal protective equipment.
Environmental precautions:	Do not flush into surface water or sanitary sewer system.
Methods for cleaning up:	Soak up with inert absorbent material.

7. HANDLING AND STORAGE

Storage:

ROOM TEMPERATURE

Handling:	Use only in area provided with appropriate exhaust ventilation.
Safe handling advice:	Wear personal protective equipment. Remove and wash contaminated clothing before reuse.

Technical measures/storage conditions: Keep containers tightly closed in a cool, well-ventilated place. Keep away from heat and sources of ignition Keep container tightly closed in a dry and well-ventilated place.

Incompatible products: Oxidising and spontaneously flammable products

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures: Ensure adequate ventilation, especially in confined areas.
PERSONAL PROTECTIVE EQUIPMENT
Respiratory protection: Breathing apparatus only if aerosol or dust is formed.
Hand protection: Pvc or other plastic material gloves
Skin and body protection: Impervious clothing Long sleeved clothing
Eye protection: Safety glasses with side-shields
Hygiene measures: Handle in accordance with good industrial hygiene and safety practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance and Odor	Colorless crystals or liquid; becomes dark with age or exposure to air and light; phenolic odor
Physical state:	Solid
Formula:	C7H8O
Molecular weight:	108.14
Melting point/range:	31 °C
Boiling point/range:	191 °C at 1013 hPa
Density:	1.0465 g/cm3 at 20 °C
Vapor pressure:	.24 hPa at 20 °C
Evaporation rate:	No data available
Vapor density:	3.7 (air = 1)
Solubility (in water):	Soluble
Flash point:	81 °C (closed cup and DIN 51758)
Autoignition temperature:	555 °C

10. STABILITY AND REACTIVITY

Stability: Stable under recommended storage conditions.
Polymerization: None under normal processing.
Hazardous decomposition products: Thermal decomposition can lead to release of irritating gases and vapours such as carbon oxides.
Materials to avoid: -
Forms explosive mixture with air. Incompatible with strong acids, oxidizers, alkalies, aliphatic amines, amides, chlorosulfonic acid, oleum. Liquid attacks some plastics and rubber.
Conditions to avoid: Exposure to air or moisture over prolonged periods.

11. TOXICOLOGICAL INFORMATION

Product Information
Acute toxicity

Components	**RTECS Number:**	**Selected LD50s and LC50s**
o-CRESOL	GO6300000	Inhalation LC50 Rat : >1220 mg/m³/1H Inhalation LC50 Mouse : 179 mg/m³/2H Oral LD50 Rat : 121 mg/kg Oral LD50 Mouse : 344 mg/kg Dermal LD50 Rabbit : 890 mg/kg

Chronic toxicity: Chronic exposure may cause nausea and vomiting, higher exposure causes unconsciousness.
Local effects: Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting.
Specific effects: May include moderate to severe erythema (redness) and moderate edema (raised skin), nausea, vomiting, headache.
Primary irritation: No data is available on the product itself.
Carcinogenic effects: Possible carcinogen
Mutagenic effects: No data is available on the product itself.
Reproductive toxicity: No data is available on the product itself.

Components	NIOSH - Health Effects	NIOSH - Target Organs
o-CRESOL	Skin, liver, kidney, and pancreas effects	Eyes, skin, respiratory system, CNS, liver, kidneys, pancreas, CVS

12. ECOLOGICAL INFORMATION

Mobility: No data available
Bioaccumulation: No data available
Ecotoxicity effects: No data available
Aquatic toxicity: May cause long-term adverse effects in the aquatic environment.

Components	U.S. DOT - Appendix B - Marine Pollutan	U.S. DOT - Appendix B - Severe Marine Pollutants	United Kingdom - The Red List:
o-CRESOL	Not Listed	Not Listed	Not Listed

Components	Germany VCI (WGK)	World Health Organization (WHO) - Drinking Water	Ecotoxicity - Fish Species Data
o-CRESOL	2	Not Listed	Not Listed

Components	Ecotoxicity - Freshwater Algae Data	Ecotoxicity - Microtox Data	Ecotoxicity - Water Flea Data
o-CRESOL	Not Listed	EC50 (5,15,30 min) Photobacterium phosphoreum:22.6 - 26.5 mg/L Microtox test:15 °C	Not Listed

Components	EPA - ATSDR Priority List	EPA - HPV Challenge Program Chemical List	California - Priority Toxic Pollutants
o-CRESOL	Rank (of 275): 195	indicator 2; Not sponsored	Not Listed

Components	California - Priority Toxic Pollutants	California - Priority Toxic Pollutants
o-CRESOL	Not Listed	Not Listed

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Residue from fires extinguished with this material may be hazardous.
Contaminated packaging: Do not re-use empty containers
Methods for cleaning up: Soak up with inert absorbent material.

14. TRANSPORT INFORMATION

UN/Id No:	2811

DOT:

Proper shipping name:	Toxic solid, organic, n.o.s.
IATA Hazard Label(s):	Toxic
Hazard Class	6.1 **-** Toxic substances - dermal
Packing group:	III

Emergency Response Guide Number (ERG):	154

Components	**U.S. DOT - Appendix A Table 1 - Reportable Quantities**
o-CRESOL	RQ = 100 pounds (45.4 kg); (Listed under "Cresols"); also listed as o-Cresylic acid

TDG (Canada):

WHMIS hazard class:

B3 combustible liquids
D1a very toxic materials
E corrosive material

: : :

IMDG/IMO

Proper shipping name:	Toxic solid, organic, n.o.s.
IMDG - Hazard Classifications	Not Applicable

Components	**U.S. DOT - Appendix B - Marine Pollutan**	**U.S. DOT - Appendix B - Severe Marine Pollutants**
o-CRESOL	Not Listed	Not Listed

IMO-labels:

15. REGULATORY INFORMATION

International Inventories

Components
o-CRESOL

Inventory - United States TSCA - Sect. 8(b)	Present
Canada DSL Inventory List -	Not Listed
Australia (AICS):	Present
EU EINECS List -	202-423-8; C7H8O
Inventory - Japan:	3-499; 4-57
Korean KECL:	KE-24792
Philippines PICCS:	Present

U.S. regulations:

Components	**California Proposition 65 -**	**Massachusetts Right to Know List:**	**New Jersey Right to Know List:**	**Pennsylvania Right to Know List:**
o-CRESOL	Not Listed	extraordinarily hazardous	sn 1426	environmental hazard

Components	**Florida substance List:**	**Rhode Island Right to Know List:**	**Illinois - Toxic Air Contaminants**	**Connecticut - Hazardous Air Pollutants**
o-CRESOL	[present]	Not Listed	Present on HAP list	Not Listed

Components	**SARA 313 Emission reporting/Toxic Release of Chemicals**	**CERCLA/SARA - Section 302 Extremely Haz**	**NTP:**	**IARC:**
o-CRESOL	form R reporting required for 1.0% de minimis concentration	TPQ = 1000/10,000 pounds; RQ = 100 pounds	None	None

SARA 313 Notification: The above is your notification as to the SARA 313 listing for this product(s) pursuant to Section 313 of Title III of the Superfund Ammendments and Reauthorization Act of 1986 and 40 CFR Part 372.

If you are unsure if you are subject to the reporting requirements of Section 313, or need more information, please call the EPA Emergency Planning and Community Right-To-Know Information Hotline: (800) 535-0202 or (202) 479-2499 (in Washington, DC or Alaska).

State Notification: The above information is your notice as to the Right-to-Know listings of the stated product(s). Individual states will list chemicals for a variety of reasons including, but not limited to, the compounds toxicity; carcinogenic, tumorigenic and/or reproductive hazards; and the compounds environmental impact if accidentally released.

16. OTHER INFORMATION

Prepared by: Health & Safety
Disclaimer: The information and recommendations contained herein are based upon tests believed to be reliable. However, MP Biomedicals does not guarantee the accuracy or completeness NOR SHALL ANY OF THIS INFORMATION CONSTITUTE A WARRANTY, WHETHER EXPRESSED OR IMPLIED, AS TO THE SAFETY OF THE GOODS, THE MERCHANTABILITY OF THE GOODS, OR THE FITNESS OF THE GOODS FOR A PARTICULAR PURPOSE. Adjustment to conform to actual conditions of usage maybe required. MP Biomedicals assumes no responsibility for results obtained or for incidental or consequential damages, including lost profits arising from the use of these data. No warranty against infringement of any patent, copyright or trademark is made or implied.

End of Safety Data Sheet

Material Safety Data Sheet

Version 4.0
Revision Date 07/28/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Propylbenzene
Product Number	:	P52407
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

Target Organs

Lungs, Eyes, Kidney

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H401	Toxic to aquatic life.

Precautionary statement(s)

P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER or doctor/ physician.
P331	Do NOT induce vomiting.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	1
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Ingestion Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : 1-Phenylpropane

Formula : C_9H_{12}
Molecular Weight : 120.19 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Propylbenzene			
103-65-1	203-132-9	601-024-00-X	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid inhalation of vapour or mist.

Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
For prolonged or repeated contact use protective gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-99 °C (-146 °F) - lit.
Boiling point	159 °C (318 °F) - lit.
Flash point	42.0 °C (107.6 °F) - closed cup
Ignition temperature	450 °C (842 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	6 %(V)
Density	0.862 g/cm3 at 25 °C (77 °F)
Water solubility	slightly soluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 6,040 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - rat - 2 h - 65000 ppm

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	Aspiration hazard if swallowed - can enter lungs and cause damage. May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Damage to the lungs., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: DA8750000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h

Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

Product
This combustible material may be burned in a chemical incinerator equipped with an afterburner and scrubber. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: PROPYLBENZENE
Marine pollutant: No

IATA
UN-Number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	2007-03-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.0
Revision Date 07/06/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Nickel
Product Number	:	577995
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable solid, Carcinogen, Target Organ Effect, Skin sensitiser

Target Organs

Lungs

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H228	Flammable solid.
H317	May cause an allergic skin reaction.
H351	Suspected of causing cancer.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P273	Avoid release to the environment.
P280	Wear protective gloves.
P314	Get medical advice/attention if you feel unwell.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	3

NFPA Rating

Health hazard:	2
Fire:	0
Reactivity Hazard:	3

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.

Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Ni
Molecular Weight : 58.69 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Nickel, powder [particle diameter < 1 mm]			
7440-02-0	231-111-4	028-002-01-4	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Avoid breathing dust.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Sweep up and shovel. Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13). Keep in suitable, closed containers for disposal. Contain spillage, pick up with an electrically protected vacuum cleaner or by wet-brushing and transfer to a container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Store in cool place.

Handle and store under inert gas. Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Nickel, powder [particle diameter < 1 mm]	7440-02-0	TWA	1 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	1.5 mg/m3	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Dermatitis Pneumoconiosis Not suspected as a human carcinogen: The agent is not suspected to be a human carcinogen on the basis of properly conducted epidemiologic studies in humans. These studies have sufficiently long follow-up, reliable exposure histories, sufficiently high dose, and adequate statistical power to conclude that exposure to the agent does not convey a significant risk of cancer to humans; OR, the evidence suggesting a lack of carinogenicity in experimental anmimals is supporrted by mechenistic data.				
		TWA	1 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	white, silver, metallic

Safety data

pH	no data available
Melting point	1,453 °C (2,647 °F) - lit.
Boiling point	2,732 °C (4,950 °F) - lit.

Flash point	not applicable
Flammability (solid, gas)	The substance or mixture is a flammable solid with the subcategory 2.
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	1 hPa (1 mmHg) at 1,810 °C (3,290 °F)
Density	8.9 g/cm3 at 25 °C (77 °F)
Water solubility	insoluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
acids, Oxidizing agents, Sulphur compounds, Hydrogen gas, Oxygen, Methanol, organic solvents, Aluminium, Fluorine, Ammonia

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Nickel/nickel oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
May cause allergic skin reaction.

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Nickel, powder [particle diameter < 1 mm])
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	Reasonably anticipated to be a human carcinogen (Nickel, powder [particle diameter < 1 mm])
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
Inhalation - Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Additional Information

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 1.3 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 1 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powders, flammable, n.o.s. (Nickel, powder [particle diameter < 1 mm])
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 3089 Class: 4.1 Packing group: II EMS-No: F-G, S-G
Proper shipping name: METAL POWDER, FLAMMABLE, N.O.S. (Nickel, powder [particle diameter < 1 mm])
Marine pollutant: No

IATA
UN-Number: 3089 Class: 4.1 Packing group: II
Proper shipping name: Metal powder, flammable, n.o.s. (Nickel, powder [particle diameter < 1 mm])

15. REGULATORY INFORMATION

OSHA Hazards
Flammable solid, Carcinogen, Target Organ Effect, Skin sensitiser

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Nickel, powder [particle diameter < 1 mm]	7440-02-0	2007-09-28

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.0
Revision Date 07/28/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Butylbenzene
Product Number	:	B90203
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Combustible Liquid

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H400	Very toxic to aquatic life.

Precautionary statement(s)

P273	Avoid release to the environment.

HMIS Classification

Health hazard:	0
Flammability:	2
Physical hazards:	0

NFPA Rating

Health hazard:	0
Fire:	2
Reactivity Hazard:	0

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms	:	1-Phenylbutane
Formula	:	$C_{10}H_{14}$
Molecular Weight	:	134.22 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Butylbenzene			
104-51-8	203-209-7	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid inhalation of vapour or mist.
Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage. Store in cool place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid, clear
Colour	colourless

Safety data

pH	no data available
Melting point	-88 °C (-126 °F) - lit.
Boiling point	183 °C (361 °F) - lit.
Flash point	59.0 °C (138.2 °F) - closed cup
Ignition temperature	412 °C (774 °F)
Lower explosion limit	0.8 %(V)
Upper explosion limit	5.8 %(V)
Density	0.86 g/cm3 at 25 °C (77 °F)
Water solubility	insoluble

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks.

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Additional Information
RTECS: CY9070000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates.	Immobilization EC50 - Daphnia magna (Water flea) - 0.34 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life.

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenes
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant: No

IATA
UN-Number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

15. REGULATORY INFORMATION

OSHA Hazards
Combustible Liquid

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 04/08/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Naphthalene
Product Number	:	147141
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable solid, Carcinogen, Highly toxic by inhalation, Toxic by ingestion, Irritant

Target Organs

Eyes, Blood, Kidney, Lungs, Central nervous system, Liver, Heart

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H228	Flammable solid.
H302	Harmful if swallowed.
H315 + H320	Causes skin and eye irritation.
H330	Fatal if inhaled.
H351	Suspected of causing cancer.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P260	Do not breathe dust/fume/gas/mist/vapours/spray.
P273	Avoid release to the environment.
P281	Use personal protective equipment as required.
P284	Wear respiratory protection.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.
P501	Dispose of contents/container to an approved waste disposal plant.

HMIS Classification

Health hazard:	3
Chronic Health Hazard:	*
Flammability:	0
Physical hazards:	2

NFPA Rating

Health hazard: 4
Fire: 2
Reactivity Hazard: 2

Potential Health Effects

Inhalation May be fatal if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion Toxic if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : $C_{10}H_8$
Molecular Weight : 128.17 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Naphthalene			
91-20-3	202-049-5	601-052-00-2	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid dust formation. Avoid breathing dust. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Naphthalene	91-20-3	TWA	10 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Eye & Upper Respiratory Tract irritation Hematologic effects Eye damage Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories. Danger of cutaneous absorption				
		STEL	15 ppm	2007-01-01	USA. ACGIH Threshold Limit Values (TLV)
	Eye & Upper Respiratory Tract irritation Hematologic effects Eye damage Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories. Danger of cutaneous absorption				
		TWA	10 ppm 50 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	15 ppm 75 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		TWA	10 ppm 50 mg/m3	1997-08-04	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	The value in mg/m3 is approximate.				

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Face shield and safety glasses

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	solid

Safety data

pH	no data available
Melting point	80 - 82 °C (176 - 180 °F) - lit.

Boiling point	218 °C (424 °F) - lit.
Flash point	80.0 °C (176.0 °F) - closed cup
Flammability (solid, gas)	The substance or mixture is a flammable solid with the subcategory 1.
Ignition temperature	526 °C (979 °F)
Lower explosion limit	0.9 %(V)
Upper explosion limit	5.9 %(V)
Vapour pressure	1.3 hPa (1.0 mmHg) at 53.0 °C (127.4 °F) 0.04 hPa (0.03 mmHg) at 25.0 °C (77.0 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 3.30

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 490.0 mg/kg

LC50 Inhalation - rat - 1 h - > 340 mg/m3
Remarks: Sense Organs and Special Senses (Nose, Eye, Ear, and Taste):Eye:Lacrimation. Behavioral:Somnolence (general depressed activity).

LD50 Dermal - rabbit - 20,000 mg/kg

Skin corrosion/irritation
Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC:	2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)
	2B - Group 2B: Possibly carcinogenic to humans (Naphthalene)
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: Reasonably anticipated to be a human carcinogen (Naphthalene)

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be fatal if inhaled. Causes respiratory tract irritation.
Ingestion	Toxic if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Absorption into the body leads to the formation of methemoglobin which in sufficient concentration causes cyanosis. Onset may be delayed 2 to 4 hours or longer., Naphthalene is retinotoxic and systemic absorption of its vapors above 15ppm, may result in:, cataracts, optic neuritis, corneal injury, Eye irritation, Ingestion may provoke the following symptoms:, hemolytic anemia, hemoglobinuria, Nausea, Headache, Vomiting, Gastrointestinal disturbance, Convulsions, anemia, Kidney injury may occur., Seizures., Coma.

Additional Information
RTECS: QJ0525000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 0.9 - 9.8 mg/l - 96.0 h
	LC50 - Pimephales promelas (fathead minnow) - 1 - 6.5 mg/l - 96.0 h
	NOEC - other fish - 1.8 mg/l - 3.0 d
	LOEC - other fish - 3.2 mg/l - 3.0 d
Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 1.00 - 3.40 mg/l - 48 h
Toxicity to algae	EC50 - No information available. - 33.00 mg/l - 24 h

Persistence and degradability

Bioaccumulative potential

Bioaccumulation	Oncorhynchus mykiss (rainbow trout) - 28 d Bioconcentration factor (BCF): 13,000

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined
Reportable Quantity (RQ): 100 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 1334 Class: 4.1 Packing group: III EMS-No: F-A, S-G
Proper shipping name: NAPHTHALENE, REFINED
Marine pollutant: No

IATA
UN-Number: 1334 Class: 4.1 Packing group: III
Proper shipping name: Naphthalene, refined

15. REGULATORY INFORMATION

OSHA Hazards
Flammable solid, Carcinogen, Highly toxic by inhalation, Toxic by ingestion, Irritant

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Naphthalene	91-20-3	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer. Naphthalene	91-20-3	1990-01-01

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 04/07/2011
Print Date 09/29/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Methyl *tert*-butyl ether
Product Number	:	48027
Brand	:	Supelco
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Irritant, Carcinogen

Target Organs

Kidney, Central nervous system

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Oral (Category 5)
Skin irritation (Category 2)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H225	Highly flammable liquid and vapour.
H303	May be harmful if swallowed.
H315	Causes skin irritation.

Precautionary statement(s)

P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.

HMIS Classification

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	0

NFPA Rating

Health hazard:	2
Fire:	3

Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. Causes respiratory tract irritation.
Skin May be harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms : MTBE
tert-Butyl methyl ether
Methyl *tert*-butyl ether

Formula : $C_5H_{12}O$
Molecular Weight : 88.15 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
tert-Butyl methyl ether			
1634-04-4	216-653-1	603-181-00-X	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Store in cool place. Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
tert-Butyl methyl ether	1634-04-4	TWA	50 ppm	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Upper Respiratory Tract irritation Kidney damage Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure.			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
impervious clothing, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	no data available

Safety data

pH	no data available

Melting point/freezing point	no data available
Boiling point	55 - 56 °C (131 - 133 °F) - lit.
Flash point	-33.0 °C (-27.4 °F) - closed cup
Ignition temperature	374 °C (705 °F)
Autoignition temperature	374.0 °C (705.2 °F)
Lower explosion limit	1.6 %(V)
Upper explosion limit	15.1 %(V)
Vapour pressure	1,018.7 hPa (764.1 mmHg) at 55.0 °C (131.0 °F) 279.2 hPa (209.4 mmHg) at 20.0 °C (68.0 °F)
Density	0.74 g/cm3 at 25 °C (77 °F)
Water solubility	no data available
Partition coefficient: n-octanol/water	log Pow: 1.77 log Pow: 0.94
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions

Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Oxidizing agents, Strong acids

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 4,000 mg/kg

Inhalation LC50
LC50 Inhalation - rat - 4 h - 23576 ppm

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Skin irritation

Serious eye damage/eye irritation
Eyes - rabbit - No eye irritation

Respiratory or skin sensitization
Will not occur

Germ cell mutagenicity
no data available

Carcinogenicity

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (tert-Butyl methyl ether)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. Causes respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. Causes skin irritation.
Eyes	Causes eye irritation.

Signs and Symptoms of Exposure
Nausea, Vomiting, Dizziness, Central nervous system depression, Aspiration or inhalation may cause chemical pneumonitis., MTBE (methyl-tert-butyl ether) is reported to metabolize to tert-butyl alcohol and formaldehyde by microsomal demethylation, MTBE (methyl-tert-butyl ether) should be considered a "potential human carcinogen" due to an increase in leydig interstitial cell tumors of testes in male rats and an increase in lymphomas, leukemias, and uterine sarcomas in female rats., In another unpublished study MTBE was shown to be carcinogenic due to "increased incidence of a rare type of kidney tumor" in male rats and an "increase in the incidence of hepatocellular adenomas" in female mice., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: KN5250000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Pimephales promelas (fathead minnow) - 672.00 mg/l - 96 h

LC50 - other fish - > 1,000.00 mg/l - 96 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2398 Class: 3 Packing group: II EMS-No: F-E, S-D
Proper shipping name: METHYL BUTYL ETHER
Marine pollutant: No

IATA
UN number: 2398 Class: 3 Packing group: II
Proper shipping name: Methyl tert-butyl ether

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Irritant, Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date

tert-Butyl methyl ether	1634-04-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
tert-Butyl methyl ether	1634-04-4	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

MSDS Safety Information

TOP

FSC: 6550 **MSDS Date:** 06/02/1992 **MSDS Num:** BWJFX

Submitter: F BT **LIIN:** 00F037505 **Tech Review:** 12/09/1994 **Status CD:** C

Product ID: F44 METHYLENE CHLORIDE **MFN:** 01

Article: N **Kit Part:** N

Responsible Party **Cage:** 84898

Name: CHEM SERVICE INC

Address: 660 TOWER LN **Box:** 3108

City: WEST CHESTER **State:** PA **Zip:** 19381−3108

Country: US

Info Phone Number: 215−692−3026/800−452−9994

Emergency Phone Number: 215−692−3026/800−452−9994

Preparer's Name: N/P

Proprietary Ind: N Review Ind: Y

Published: Y Special Project CD: N

Preparer Co. when other than Responsible Party Co.

TOP

Cage: 84898 **Assigned Ind:** N

Name: CHEM SERVICE INC

Address: N/K **Box:** 3108

City: WEST CHESTER **State:** PA **Zip:** 19381

Contractor Summary

TOP

Cage: 84898 **Name:** CHEM SERVICE INC

Address: N/K **Box:** 3108

City: WEST CHESTER **State:** PA **Zip:** 19381

Country: US **Phone:** 215−692−3026

Cage: 8Y898 **Name:** CHEM SERVICE, INC

Address: 660 TOWER LN **Box:** 599

City: WEST CHESTER **State:** PA **Zip:** 19381

Country: US **Phone:** 610−692−3026, 610−692−3026

Ingredients

TOP

Cas: 75−09−2 Code: M RTECS #: PA8050000 Code: M

Name: **DICHLOROMETHANE (METHYLENE CHLORIDE) (SUSP HUMAN CARC BY ACGIH, SUSP ANIM CARC BY IARC; NTP − IARC GROUP 2B) *94−4***

% Text: N/K Environmental Wt:

Other REC Limits: N/K

OSHA PEL:	500 PPM	Code: M	OSHA STEL:		Code:
ACGIH TLV:	50 PPM	Code: M	ACGIH STEL:	N/P	Code:
EPA Rpt Qty:	1000 LBS		DOT Rpt Qty:	1000 LBS	

Ozone Depleting Chemical: N

========== Health Hazards Data ==========

TOP

LD50 LC50 Mixture ORAL LD50 (RAT/MOUSE): 2136 MG/KG

Route Of Entry Inds − Inhalation: YES	Skin: YES	Ingestion: YES
Carcinogenicity Inds − NTP: YES	IARC: YES	OSHA: NO

Health Hazards Acute And Chronic

SKIN: HARMFUL IF ABSORBED, IRRITATION. INHALATION: HARMFUL, IRRITATION TO RESPIRATORY TRACT & MUCOUS MEMBRANES. INGESTION: HARMFUL, LIVER DAMAGE. EYES: IRRITATION. COMPOUND IS CONSIDERED TO BE SLIGHTL Y TOXIC.

Explanation Of Carcinogenicity

SEE INGREDIENTS

Signs And Symptions Of Overexposure

IRRITATION.

Medical Cond Aggravated By Exposure

N/K

First Aid

EYES: FLUSH W/WATER FOR 15−20 MINS. SKIN: FLUSH W/WATER FOR 15−20 MINS. IF NOT BURNED, WASH W/SOAP & WATER TO CLEANSE. INHALATION: REMOVE TO FRESH AIR. GIVE CPR/OXYGEN IF NEEDED & CONTINUE UNTIL MEDIC AL ASSISTANCE ARRIVES. KEEP WARM & QUIET. INGESTION: DON'T GIVE LIQUIDS/INDUCE VOMITING IF UNCONSCIOUS/CONVULSING. IF VOMITING, WATCH CLOSELY TO AVOID AIRWAY OBSTRUCTION. (SEE SUPP)

Spill Release Procedures

EVACUATE AREA. WEAR APPRORPRIATE OSHA REGULATED EQUIPMENT. VENTILATE AREA. ABSORB ON VERMICULITE/SIMILAR MATERIAL. SWEEP UP & PLACE IN APPROPRIATE CONTAINER/HOLD FOR DISPOSAL. WASH CONTAMINATED SURFAC ES TO REMOVE ANY RESIDUES.

Neutralizing Agent

N/K

Waste Disposal Methods

BURN IN A CHEMICAL INCINERATOR EQUIPPED W/AN AFTERBURNER & SCRUBBER IAW/FEDERAL, STATE & LOCAL REGULATIONS.

Handling And Storage Precautions

STORE IN A COOL DRY PLACE ONLY W/COMPATIBLE CHEMICALS. KEEP TIGHTLY CLOSED. STORE UNDER REFRIGERATION.

Other Precautions

AVOID CONTACT W/SKIN, EYES & CLOTHING. DON'T BREATH VAPORS. CONTACT LENSES SHOULDN'T BE WORN IN THE LABORATORY. ALL CHEMICALS SHOULD BE CONSIDERED HAZARDOUS. AVOID DIRECT

PHYSICAL CONTACT. DON'T USE M AGNESIUM/ALLUMINUM/ALLOYS AS CONTAINERS.

========== Fire and Explosion Hazard Information ==========

TOP

Flash Point Method: N/P

Flash Point:

Flash Point Text: NON−FLAMMABLE

Autoignition Temp:

Autoignition Temp Text: N/A

Lower Limits: 12

Upper Limits: 19

Extinguishing Media

CO2, DRY CHEMICAL POWDER/SPRAY.

Fire Fighting Procedures

N/K

Unusual Fire/Explosion Hazard

VOLATILE. SENSITIVE TO HEAT. DECOMPOSITION PRODUCTS ARE CORROSIVE.

========== Control Measures ==========

TOP

Respiratory Protection

WEAR APPROPRIATE OSHA/MSHA APPROVED SAFETY EQUIPMENT.

Ventilation

CHEMICAL SHOULD BE HANDLED ONLY IN A HOOD.

Protective Gloves

N/K

Eye Protection

EYE SHIELDS

Other Protective Equipment

N/K

Work Hygienic Practices

REMOVE/LAUNDER CONTAMINATED CLOTHING BEFORE REUSE.

Supplemental Safety and Health

FIRST AID CONT'D: OBTAIN MEDICAL ATTENTION IN ALL CASES.

========== Physical/Chemical Properties ==========

TOP

HCC:

NRC/State LIC No:

Net Prop WT For Ammo:

Boiling Point: B.P. Text: 103.55F

Melt/Freeze Pt: M.P/F.P Text: −139F

Decomp Temp: Decomp Text: N/K

Vapor Pres: 350 Vapor Density: 2.9

Volatile Org Content %: Spec Gravity: N/K

VOC Pounds/Gallon: PH: N/K

VOC Grams/Liter: Viscosity: N/P

Evaporation Rate & Reference: (BU AC =1): 27.5

Solubility in Water: SLIGHT

Appearance and Odor: COLORLESS LIQUID W/ETHER LIKE ODOR.

Percent Volatiles by Volume: N/K Corrosion Rate: N/K

========== Reactivity Data ========== TOP

Stability Indicator: YES

Stability Condition To Avoid: HEAT.

Materials To Avoid: STRONG BASES/OXIDIZING AGENTS, MAGNESIUM, ALUMINUM.

Hazardous Decomposition Products: TOXIC FUMES.

Hazardous Polymerization Indicator: NO

Conditions To Avoid Polymerization N/K

:

========== Toxicological Information ========== TOP

Toxicological Information: N/P

========== Ecological Information ========== TOP

Ecological: N/P

========== MSDS Transport Information ========== TOP

Transport Information: N/P

========== Regulatory Information ========== TOP

Sara Title III Information: N/P

Federal Regulatory Information: N/P

State Regulatory Information: N/P

========== Other Information ==========

TOP

Other Information: N/P

==========
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Material Safety Data Sheet

Version 4.2
Revision Date 10/26/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Mercury
Product Number	:	261017
Brand	:	Sigma-Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Target Organ Effect, Highly toxic by inhalation, Respiratory sensitiser, Teratogen, Reproductive hazard

Target Organs

Kidney

GHS Classification
Acute toxicity, Inhalation (Category 1)
Respiratory sensitization (Category 1)
Reproductive toxicity (Category 1A)
Specific target organ toxicity - repeated exposure, Inhalation (Category 1)
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H330	Fatal if inhaled.
H334	May cause allergy or asthma symptoms or breathing difficulties if inhaled.
H360	May damage fertility or the unborn child.
H372	Causes damage to organs through prolonged or repeated exposure if inhaled.
H410	Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)

P201	Obtain special instructions before use.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P273	Avoid release to the environment.
P284	Wear respiratory protection.
P310	Immediately call a POISON CENTER or doctor/ physician.

P501 Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification

Health hazard: 4
Chronic Health Hazard: *
Flammability: 0
Physical hazards: 0

NFPA Rating

Health hazard: 4
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be fatal if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.
Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Hg
Molecular Weight : 200.59 g/mol

Component		Concentration
Mercury		
CAS-No.	7439-97-6	-
EC-No.	231-106-7	
Index-No.	080-001-00-0	

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIREFIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for firefighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Mercury/mercury oxides.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Wear respiratory protection. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Soak up with inert absorbent material and dispose of as hazardous waste. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Store under inert gas.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Basis
Mercury	7439-97-6	C	0.1 mg/m3	USA. NIOSH Recommended Exposure Limits
Remarks	Potential for dermal absorption			
		CEIL	1.0mg/10m3	USA. Occupational Exposure Limits (OSHA) - Table Z2
		TWA	0.05 mg/m3	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
	Skin notation			
		TWA	0.025 mg/m3	USA. ACGIH Threshold Limit Values (TLV)
	Central Nervous System impairment Kidney damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen: Agents which cause concern that they could be carcinogenic for humans but which cannot be assessed conclusively because of a lack of data. In vitro or animal studies do not provide indications of carcinogenicity which are sufficient to classify the agent into one of the other categories. Danger of cutaneous absorption			
		TWA	0.05 mg/m3	USA. NIOSH Recommended Exposure Limits
	Potential for dermal absorption			

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Face shield and safety glasses Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Complete suit protecting against chemicals, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	liquid
Colour	no data available

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: -38.87 °C (-37.97 °F) - lit.
Boiling point	356.6 °C (673.9 °F)
Flash point	not applicable
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	< 0.01 hPa (< 0.01 mmHg) at 20 °C (68 °F) 1 hPa (1 mmHg) at 126 °C (259 °F)
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	6.93 - (Air = 1.0)
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents, Ammonia, Azides, Nitrates, Chlorates, Copper

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Mercury/mercury oxides.
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

IARC:	3 - Group 3: Not classifiable as to its carcinogenicity to humans (Mercury)
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

Teratogenicity

Presumed human reproductive toxicant

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
Causes damage to organs through prolonged or repeated exposure.

Aspiration hazard
no data available

Potential health effects

Inhalation	May be fatal if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Mercury accumulates in almost all tissues, especially in the:, Kidney, Effects due to ingestion may include:, Nausea, Vomiting, Diarrhoea, intestinal bleeding

Synergistic effects
no data available

Additional Information
RTECS: OV4550000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Labeo rohita - 0.018 mg/l - 96.0 h

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Carassius auratus (goldfish) - 1,789 d Bioconcentration factor (BCF): 155,986

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

IMDG
UN number: 2809 Class: 8 Packing group: III EMS-No: F-A, S-B
Proper shipping name: MERCURY
Marine pollutant: No

IATA
UN number: 2809 Class: 8 Packing group: III
Proper shipping name: Mercury

15. REGULATORY INFORMATION

OSHA Hazards
Target Organ Effect, Highly toxic by inhalation, Respiratory sensitiser, Teratogen, Reproductive hazard

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Mercury	7439-97-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Mercury	7439-97-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Mercury	7439-97-6	2007-07-01

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause birth defects or other reproductive harm. Mercury	7439-97-6	2007-09-28

16. OTHER INFORMATION

Further information

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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

material safety data sheet

Section 1. IDENTIFICATION

Trade Name:

2−Butanone (Methyl Ethyl Ketone), Natural

Synonyms: Butan−2−one

Product Number: 0217000NAT FEMA Number: 2170

Section 2. COMPOSITION / INFORMATION ON INGREDIENT

Ingredient: 2−Butanone (Methyl Ethyl Ketone), Natural

CAS Number: 78−93−3
Molecular Formula: C4 H8 O

Section 3. HAZARDS IDENTIFICATION

Harmful if Swallowed
Irritating to Eyes, Respiratory System and Skin
Flammable
Risk of Serious Damage to Eyes

Section 4. FIRST AID MEASURES

EYE CONTACT: Immediately flush eyes with water for at least 15 minutes. Get medical attention. SKIN CONTACT: Immediately wash skin with soap and copius amounts of water. INHALATION: Immediately remove to FRESH AIR. If not breathing, give artificial respiration. If breathing difficult, give oxygen. Get medical attention.

Section 5. FIRE FIGHTING MEASURES

MEANS OF EXTINCTION: Carbon dioxide, dry chemical powder, or appropriate foam. Water: if water must be used, spray only. UNUSUAL FIRE/EXPLOSION HAZARDS: Avoid heat, sparks, and open flames. Hazardous Combustion Products Carbon dioxide, carbon monoxide, acrid fumes.

Section 6. ACCIDENTAL RELEASE MEASURES

PERSONAL PRECAUTIONS: Refer to Section 8. CLEANUP PROCEDURES: Small spills should be adsorbed by dirt, sand or other suitable adsorbent. Large spills may be diked with earth and pumped to closed containers for recovery or disposal. At temperatures less than 15 C, material may crystallize and form a solid mass. Ventilate area and wash spill site after material pickup is complete.

Section 7. HANDLING AND STORAGE

HANDLING − USER EXPORESURE: Do not breathe vapor. Avoid contact with eyes,. skin and clothing. Wear safety glasses or goggles and rubber gloves, and apron when handling. SUGGESTED STORAGE CONDITIONS: Store in tightly sealed original containers with minimum head space. Avoid prolonged exposure to light, heat, cold, and air.

SUGGESTED STORAGE CONDITIONS: Store at 40−70F in tightly sealed original containers with minimum head space. Avoid prolonged exposure to light, heat and air.
SHELF LIFE: 6 months under suggested storage conditions unless otherwise noted.

Section 8. EXPOSURE AND PROTECTION CONTROLS

Safety shower and eye bath. Mechanical exhaust may be needed. Government approved respirator. Compatible chemical resistant gloves. Chemical safety goggles. Wash contaminated clothing thoroughly before reuse. Clean contaminated equipment thoroughly with soap and water.

Section 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: colorless translucent liquid
Sensory Properties: fragrant mint−like moderatly sharp odor
Molecular Weight: 72.1066
Purity (by G.C.): 98% Min.
Specific Gravity @ 25 C: 0.8072 − 0.8572
Refractive Index @ 20 C: 1.3763 − 1.3843
Optical Rotation: N/A
Acid Value: N/A
Melting Point/Melting Point Range (C): −86.3
Boiling Point/Boiling Point Range (C): 79.6
Flash Point (C) (Tag Closed Cup): −7
Flammability: N/A
Vapor Pressure: 78
Vapor Density (air = 1): 2.5
Evaporation Rate (Butyl Acetate = 1): 5.7
Viscosity: N/A
Partition Coefficient (n−Octanol/Water): N/A
Solubility in Water (%): N/A
Solubility in Alcohol (%): N/A
Additional Data:

Section 10. STABILITY AND REACTIVITY

CONDITIONS TO AVOID: Prolonged or excessive heat may cause decomposition. MATERIALS TO AVOID: Strong oxidizing agents, strong reducing agents. HAZARDOUS DECOMPOSITION PRODUCTS: Carbon dioxide, carbon monoxide, acrid fumes.

Section 11. TOXILOGICAL INFORMATION

MULTIPLE ROUTES OF EXPOSURE: May be harmful by inhalation, ingestion or skin absorption. Vapor or mist is irritating to eyes, mucous membranes and other upper respiratory tract. MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. For information, contact physician.

Section 12. ECOLOGICAL INFORMATION

No data available.

Section 13. DISPOSAL CONSIDERATIONS

Do not discharge to lakes, streams, ponds, or public waters. Observe all federal, state, and local environment regulations.

Section 14. TRANSPORT INFORMATION

DOT
Proper Shipping Name: METHYL ETHYL KETONE
UN#: 1193
Hazard Class:
Class 3 − Flammable Liquids
Packing Group: II
Hazard Label:
Flammable Liquid

IATA
Proper Shipping Name: METHYL ETHYL KETONE
IATA UN#: 1193
Hazard Class:

Class 3 − Flammable Liquids

Packing Group: II

Section 15. TRANSPORT INFORMATION

US and EU Additional Classification

Indication/Symbol of Danger: Xi

Indication of Danger:

Irritating to Eyes, Respiratory System and Skin

Risk Statements:

R 10 Flammable R 22 Harmful if swallowed R 34 Causes burns R 36/37/38: Irritating to eyes, respiratory system and skin. R 36/38 Irritating to eyes and skin R 36/37 Irritating to respiratory system and skin R 41 Risk of serious damage to eyes R 42 May cause sensitization by inhalation R 43 May cause sensitization by skin contact

Safety Statements:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice S 36 Wear protective clothing S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible) S26 36/37/39 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing gloves, and eye/face protection. S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)

TSCA (USA) Status: REGISTERED

EINECS (EC) Status: LISTED

DSL (Canada) Status: LISTED

AICS (Australia) Status: LISTED

MITI (Japan) Status: LISTED

Section 16. OTHER INFORMATION

Disclaimer

The information above is believed to be accurate and represents the best information currently available to us. We make no warranty, express or implied, about the information and assume no liability resulting from its use. Users should make their own investigations to determine suitability. We shall not be liable for any claims, losses, or damages of any nature whatsoever related to usage.

This product record was created by Mike Horvat on 7/15/03 1:49:17 PM, and has not been modified.

Material Safety Data Sheet

acc. to OSHA and ANSI

Printing date 06/14/2004 Reviewed on 05/28/2004

- **1 Identification of substance:**

♦ **Product details:**

♦ **Product name:** **m-Cresol**

♦ **Stock number:** A10733

♦ **Manufacturer/Supplier:**

Alfa Aesar, A Johnson Matthey Company
Johnson Matthey Catalog Company, Inc.
30 Bond Street
Ward Hill, MA 01835-8099
Emergency Phone: (978) 521-6300
CHEMTREC: (800) 424-9300
Web Site: www.alfa.com

♦ **Information Department:** Health, Safety and Environmental Department

♦ **Emergency information:**

During normal hours the Health, Safety and Environmental Department. After normal hours call Chemtrec at (800) 424-9300.

- **2 Composition/Data on components:**

♦ **Chemical characterization:**

Description: (CAS#)
m-Cresol (CAS# 108-39-4), 100%

♦ **Identification number(s):**

♦ **EINECS Number:** 203-577-9

♦ **EU Number:** 604-004-00-9

- **3 Hazards identification**

♦ **Hazard description:** T Toxic

♦ **Information pertaining to particular dangers for man and environment**

R 24/25 Toxic in contact with skin and if swallowed.
R 34 Causes burns.

♦ **Classification system**

♦ **HMIS ratings (scale 0-4)**

(Hazardous Materials Identification System)
Health (acute effects) = 3
Flammability = 1
Reactivity = 1

- **4 First aid measures**

♦ **General information**

Immediately remove any clothing soiled by the product.
In case of irregular breathing or respiratory arrest provide artificial respiration.

♦ **After inhalation**

Supply fresh air. If required, provide artificial respiration. Keep patient warm.
Seek immediate medical advice.

♦ **After skin contact**

Immediately wash with water and soap and rinse thoroughly.
Seek immediate medical advice.

♦ **After eye contact**

Rinse opened eye for several minutes under running water. Then consult a doctor.

♦ **After swallowing**

Do not induce vomiting; immediately call for medical help.
Seek immediate medical advice.

- **5 Fire fighting measures**

♦ **Suitable extinguishing agents**

Carbon dioxide, extinguishing powder or water spray. Fight larger fires with water spray or alcohol resistant foam.

♦ **Special hazards caused by the material, its products of combustion or resulting gases:**

In case of fire, the following can be released:
Carbon monoxide and carbon dioxide

♦ **Protective equipment:**

Wear self-contained respirator.
Wear fully protective impervious suit.

- **6 Accidental release measures**

♦ **Person-related safety precautions:**

Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation

♦ **Measures for environmental protection:**

Do not allow material to be released to the environment without proper governmental permits.

♦ **Measures for cleaning/collecting:**

Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Use neutralizing agent.
Dispose contaminated material as waste according to item 13.

Ensure adequate ventilation.

♦ **Additional information:**

See Section 7 for information on safe handling
See Section 8 for information on personal protection equipment.
See Section 13 for disposal information.

- **7 Handling and storage**

♦ **Handling**

♦ **Information for safe handling:**

Keep container tightly sealed.
Store in cool, dry place in tightly closed containers.
Ensure good ventilation at the workplace.

♦ **Information about protection against explosions and fires:**

Keep ignition sources away.

♦ **Storage**

♦ **Requirements to be met by storerooms and receptacles:**

No special requirements.

♦ **Information about storage in one common storage facility:**

Store away from oxidizing agents.
Do not store together with alkalies (caustic solutions).

♦ **Further information about storage conditions:**

Keep container tightly sealed.
Store in cool, dry conditions in well sealed containers.
Store under lock and key and with access restricted to technical experts or their assistants only.

- **8 Exposure controls and personal protection**

♦ **Additional information about design of technical systems:**

Properly operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute.

♦ **Components with limit values that require monitoring at the workplace:**

Cresol (all isomers)

	ppm
ACGIH TLV	5 (skin)
Belgium TWA	5 (skin)
Denmark TWA	5 (skin)
Finland TWA	5; 10−STEL (skin)
France TWA	5 (skin)
Germany TWA	5
Hungary TWA	5; 10−STEL
Ireland TWA	5 (skin)
Netherlands TWA	5 (skin)
Poland TWA	5 mg/m3
Russia TWA	5; 0.5−STEL (skin)
Switzerland TWA	5; 10−STEL (skin)
United Kingdom TWA	5 (skin)
USA PEL	5 (skin)

Components with limit values that require monitoring at the workplace:

- **Additional information:** No data

- **Personal protective equipment**

- **General protective and hygienic measures**

The usual precautionary measures for handling chemicals should be followed.
Keep away from foodstuffs, beverages and feed.
Remove all soiled and contaminated clothing immediately.
Wash hands before breaks and at the end of work.
Store protective clothing separately.
Avoid contact with the eyes and skin.

- **Breathing equipment:**

Use suitable respirator when high concentrations are present.

- **Protection of hands:** Impervious gloves

- **Eye protection:**

Safety glasses
Full face protection

- **Body protection:** Protective work clothing.

9 Physical and chemical properties:

- **General Information**

- **Form:** Liquid

- **Color:**

Colorless
Light yellow

- **Odor:** Phenol-like

	Value/Range	Unit	Method
Change in condition			
Melting point/Melting range:	11-12	° C	
Boiling point/Boiling range:	202-204	° C	
Sublimation temperature / start:	Not determined		
Flash point:	86	° C	
Ignition temperature:	Not determined		
Decomposition temperature:	Not determined		
Danger of explosion:			

Product does not present an explosion hazard.

- **Explosion limits:**
- **Lower:** 1.1 Vol %
- **Upper:** 1.4 Vol %
- **Vapor pressure:** Not determined
- **Density:** at 20 ° C 1.034 g/cm³
- **Solubility in / Miscibility with**
- **Water:** Not determined

10 Stability and reactivity

- **Thermal decomposition / conditions to be avoided:**

  Decomposition will not occur if used and stored according to specifications.
- **Materials to be avoided:**

  Bases
  Oxidizing agents
- **Dangerous reactions** No dangerous reactions known
- **Dangerous products of decomposition:** Carbon monoxide and carbon dioxide

11 Toxicological information

- **Acute toxicity:**

  LD/LC50 values that are relevant for classification:
  Oral: LD50: 828 mg/kg (mus)
  LD50: 242 mg/kg (rat)
  LDLo: 1400 mg/kg (rbt)
  Dermal: LD50: 1000 mg/kg (rat)
  LD50: 2050 mg/kg (rbt)
  Irritation of skin: severe: 517 mg/24H (rbt)
  Irritation of eyes: severe: 103 mg (rbt)
- **Primary irritant effect:**
- **on the skin:**

  Corrosive effect on skin and mucous membranes.
  Irritant to skin and mucous membranes.
- **on the eye:**

  Strong corrosive effect.
  Irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Other information (about experimental toxicology):**

Mutagenic effects have been observed with humans.

- **Subacute to chronic toxicity:**

Cresol is toxic by ingestion and skin contact. Corrosive to skin, eyes and mucous membranes. Aborption mnay cause damage to the liver, kidneys and central nervous system.

- **Additional toxicological information:**

Danger through skin absorption.
Swallowing will lead to a strong corrosive effect on mouth and throat and to the danger of perforation of esophagus and stomach.
To the best of our knowledge the acute and chronic toxicity of this substance is not fully known.
No classification data on carcinogenic properties of this material is available from the EPA, IARC, NTP, OSHA or ACGIH.

12 Ecological information:

- **General notes:**

Do not allow material to be released to the environment without proper governmental permits.

13 Disposal considerations

- **Product:**

- **Recommendation**

Consult state, local or national regulations to ensure proper disposal.

- **Uncleaned packagings:**

- **Recommendation:**

Disposal must be made according to official regulations.

14 Transport information

- **DOT regulations:**

- **Hazard class:** 6.1

- **Identification number:** UN2076

- **Packing group:** II

- **Proper shipping name (technical name):**

Cresols

- **Land transport ADR/RID (cross-border)**

- **ADR/RID class:** 6.1 Toxic substances

- **Item:** 27b

- **Danger code (Kemler):** 68
- **UN-Number:** 2076
- **Description of goods:** Cresols

- **Maritime transport IMDG:**
- **IMDG Class:** 6.1
- **UN Number:** 2076
- **Packaging group:** II
- **Proper shipping name:** Cresols

- **Air transport ICAO-TI and IATA-DGR:**
- **ICAO/IATA Class:** 6.1
- **UN/ID Number:** 2076
- **Packaging group:** II
- **Proper shipping name:** Cresols, liquid

15 Regulations

- **Product related hazard informations:**

- **Hazard symbols:** T Toxic

- **Risk phrases:**

24/25 Toxic in contact with skin and if swallowed.
34 Causes burns.

- **Safety phrases:**

36/37/39 Wear suitable protective clothing, gloves and eye/face protection.
45 In case of accident or if you feel unwell, seek medical advice immediately.

- **National regulations**

All components of this product are listed in the U.S. Environmental Protection Agency Toxic Substances Control Act Chemical substance Inventory.

- **Information about limitation of use:**

For use only by technically qualified individuals.
This product is subject to the reporting requirements of section 313 of the Emergency Planning and Community Right to Know Act of 1986 and 40CFR372.

- **16 <u>Other information:</u>**

Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is furnished without warranty, and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user.

♦ **Department issuing MSDS:** Health, Safety and Environmental Department.

♦ **Contact:** Darrell R. Sanders

Material Safety Data Sheet

Version 4.0
Revision Date 03/13/2010
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Manganese
Product Number	:	463728
Brand	:	Aldrich
Company	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone #	:	(314) 776-6555

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Water Reactive, Target Organ Effect, Reproductive hazard

Target Organs

Nerves., Lungs

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H260	In contact with water releases flammable gases which may ignite spontaneously.
H316	Causes mild skin irritation.
H320	Causes eye irritation.
H402	Harmful to aquatic life.

Precautionary statement(s)

P223	Keep away from any possible contact with water, because of violent reaction and possible flash fire.
P231 + P232	Handle under inert gas. Protect from moisture.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P370 + P378	In case of fire: Use .? for extinction.

HMIS Classification

Health hazard:	0
Chronic Health Hazard:	*
Flammability:	3
Physical hazards:	2

NFPA Rating

Health hazard:	0
Fire:	0
Reactivity Hazard:	2
Special hazard.:	W

Potential Health Effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.
Ingestion	May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Mn
Molecular Weight : 54.94 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Manganese			
7439-96-5	231-105-1	-	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing give artificial respiration Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Carbon dioxide (CO2) Dry powder

Extinguishing media which shall not be used for safety reasons
Water

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Do not flush with water. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid formation of dust and aerosols.
Provide appropriate exhaust ventilation at places where dust is formed. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Store in cool place.
Never allow product to get in contact with water during storage.

Moisture sensitive. Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value	Control parameters	Update	Basis
Manganese	7439-96-5	TWA	0.2 mg/m3	2009-01-01	USA. ACGIH Threshold Limit Values (TLV)
Remarks	Central Nervous System impairment Adopted values or notations enclosed are those for which changes are proposed in the NIC 2009 Revision or addition to the notice of intended changes See Notice of Intended Changes (NIC)				
		C	5 mg/m3	2006-02-28	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Ceiling limit is to be determined from breathing-zone air samples.				
		TWA	1 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000
		STEL	3 mg/m3	1989-01-19	USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000

Personal protective equipment

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves.

Eye protection
Safety glasses with side-shields conforming to EN166

Skin and body protection
Choose body protection according to the amount and concentration of the dangerous substance at the work place.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	grey

Safety data

pH	no data available
Melting point	1,244 °C (2,271 °F) - lit.
Boiling point	1,962 °C (3,564 °F) - lit.
Flash point	not applicable
Ignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Density	7.3 g/mL at 25 °C (77 °F)

Water solubility	no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Conditions to avoid
Heat, flames and sparks. Exposure to moisture.

Materials to avoid
acids, Halogens, Bases, Phosphorus, Sulphur oxides, Peroxides

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Manganese/manganese oxides

11. TOXICOLOGICAL INFORMATION

Acute toxicity
LD50 Oral - rat - 9,000 mg/kg

Skin corrosion/irritation
Skin - rabbit - Mild skin irritation - 24 h

Serious eye damage/eye irritation
Eyes - rabbit - Mild eye irritation - 24 h

Respiratory or skin sensitization
no data available

Germ cell mutagenicity

no data available

Carcinogenicity

Carcinogenicity - rat - Intramuscular
Tumorigenic:Equivocal tumorigenic agent by RTECS criteria. Tumorigenic:Tumors at site or application.

IARC:	No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.
ACGIH:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.
NTP:	No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA:	No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

May cause reproductive disorders.

Specific target organ toxicity - single exposure (GHS)
no data available

Specific target organ toxicity - repeated exposure (GHS)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.

Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
Men exposed to manganese dusts showed a decrease in fertility. Chronic manganese poisoning primarily involves the central nervous system. Early symptoms include languor, sleepiness and weakness in the legs. A stolid mask-like appearance of the face, emotional disturbances such as uncontrollable laughter and a spastic gait with tendency to fall in walking are findings in more advanced cases. High incidence of pneumonia has been found in workers exposed to the dust or fume of some manganese compounds.

Additional Information
RTECS: OO9275000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to daphnia and other aquatic invertebrates.	EC50 - Daphnia magna (Water flea) - 40 mg/l - 48 h

Persistence and degradability
no data available

Bioaccumulative potential
no data available

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN-Number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN-Number: 3208 Class: 4.3 Packing group: I EMS-No: F-G, S-N
Proper shipping name: METALLIC SUBSTANCE, WATER-REACTIVE, N.O.S. (Manganese)
Marine pollutant: No

IATA
UN-Number: 3208 Class: 4.3 Packing group: I
Proper shipping name: Metallic substance, water-reactive, n.o.s. (Manganese)
IATA Passenger: Not permitted for transport

15. REGULATORY INFORMATION

OSHA Hazards
Water Reactive, Target Organ Effect, Reproductive hazard

DSL Status
All components of this product are on the Canadian DSL list.

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

SARA 311/312 Hazards
Reactivity Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Manganese	7439-96-5	2007-07-01

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

Material Safety Data Sheet

Version 4.1
Revision Date 06/02/2011
Print Date 12/16/2011

1. PRODUCT AND COMPANY IDENTIFICATION

Product name	:	Zinc
Product Number	:	14409
Brand	:	Aldrich
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA
Telephone	:	+1 800-325-5832
Fax	:	+1 800-325-5052
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
No known OSHA hazards

GHS Classification
Acute aquatic toxicity (Category 1)
Chronic aquatic toxicity (Category 1)

GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P501 Dispose of contents/ container to an approved waste disposal plant.

HMIS Classification
Health hazard: 0
Flammability: 0
Physical hazards: 0

NFPA Rating
Health hazard: 0
Fire: 0
Reactivity Hazard: 0

Potential Health Effects

Inhalation May be harmful if inhaled. May cause respiratory tract irritation.
Skin May be harmful if absorbed through skin. May cause skin irritation.
Eyes May cause eye irritation.

Ingestion May be harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Formula : Zn
Molecular Weight : 65.39 g/mol

CAS-No.	EC-No.	Index-No.	Concentration
Zinc powder (stabilized)			
7440-66-6	231-175-3	030-001-01-9	-

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Flush eyes with water as a precaution.

If swallowed
Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Zinc/zinc oxides

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling
Provide appropriate exhaust ventilation at places where dust is formed. Normal measures for preventive fire protection.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place.

Keep in a dry place.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection
Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	powder
Colour	grey

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 420 °C (788 °F) - lit.
Boiling point	907 °C (1,665 °F) - lit.
Flash point	not applicable
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	7.133 g/mL at 25 °C (77 °F)
Water solubility	insoluble
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	odourless
Odour Threshold	no data available

Evaporation rate no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
no data available

Conditions to avoid
no data available

Materials to avoid
Strong oxidizing agents, Acids and bases

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Zinc/zinc oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
no data available

Inhalation LC50
no data available

Dermal LD50
no data available

Other information on acute toxicity
no data available

Skin corrosion/irritation
no data available

Serious eye damage/eye irritation
no data available

Respiratory or skin sensitization
Did not cause sensitization on laboratory animals.

Germ cell mutagenicity
no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)
no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)
no data available

Aspiration hazard
no data available

Potential health effects

Inhalation	May be harmful if inhaled. May cause respiratory tract irritation.
Ingestion	May be harmful if swallowed.
Skin	May be harmful if absorbed through skin. May cause skin irritation.
Eyes	May cause eye irritation.

Signs and Symptoms of Exposure
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: ZG8600000

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to fish	LC50 - Cyprinus carpio (Carp) - 450 µg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates.	LC50 - Daphnia magna (Water flea) - 0.068 mg/l - 48 h
	mortality NOEC - Daphnia - 0.101 - 0.14 mg/l - 7 d

Persistence and degradability
no data available

Bioaccumulative potential

Bioaccumulation	Algae - 7 d at 16 °C Bioconcentration factor (BCF): 466

Mobility in soil
no data available

PBT and vPvB assessment
no data available

Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.

Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Zinc powder (stabilized))
Marine pollutant: Marine pollutant

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Zinc powder (stabilized))

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

OSHA Hazards
No known OSHA hazards

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Zinc powder (stabilized)	7440-66-6	1993-04-24

California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Co., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale.

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