

Chlorobenzene

sc-239517

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Chlorobenzene

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Santa Cruz Biotechnology, Inc.
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EMERGENCY:

ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS

C6-H5-Cl, MCB, "benzene, chloro", "benzene chloride", chlorbenzol, chlorobenzol, chlorbenzene, monochlorbenzene, monochlorobenzene, monochlorobenzol, "phenyl chloride"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability:	2		
Toxicity:	2		
Body Contact:	2		
Reactivity:	1		
Chronic:	2		

Min/Nil=0
Low=1
Moderate=2
High=3
Extreme=4



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful by inhalation and if swallowed.

Flammable.

Vapours may cause drowsiness and dizziness.

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

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

■ The substance and/or its metabolites may bind to hemoglobin inhibiting normal uptake of oxygen. This condition, known as "methemoglobinemia", is a form of oxygen starvation (anoxia).

■ Central nervous system (CNS) depression may include general discomfort, symptoms of giddiness, headache, dizziness, nausea, anaesthetic effects, slowed reaction time, slurred speech and may progress to unconsciousness. Serious poisonings may result in respiratory depression and may be fatal.

EYE

■ Although the liquid is not thought to be an irritant, direct contact with the eye may produce transient discomfort characterized by tearing or conjunctival redness (as with windburn).

SKIN

■ The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis. The material is unlikely to produce an irritant dermatitis as described in EC Directives .

■ Skin contact with the material may damage the health of the individual; systemic effects may result following absorption.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects. Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ The material is not thought to produce respiratory irritation (as classified using animal models). Nevertheless inhalation of vapors, fumes or aerosols, especially for prolonged periods, may produce respiratory discomfort and occasionally, distress.

■ Inhalation of vapours may cause drowsiness and dizziness. This may be accompanied by narcosis, reduced alertness, loss of reflexes, lack of coordination and vertigo.

■ Headaches and upper respiratory tract and eye irritation were reported in a worker exposed to chlorobenzene contained in a glue preparation. Inhalation of 200 ppm may produce mucous membrane irritation and coughing whilst higher concentrations produce central nervous system depression with headache, dizziness, drowsiness, somnolence, transient anaesthesia, and incoherence, cyanosis from methaemoglobinaemia, spastic contractions of the extremities, rapid respiration, weak and irregular pulse, burgundy-red urine, loss of consciousness, coma and respiratory and circulatory collapse. Narcosis may also result.

Rats exposed for 2 hours at 1200 ppm showed definite narcosis but 220-660 ppm could be tolerated without obvious clinical signs of sedation. Central nervous system depression was seen at 5850 ppm.

■ Inhalation of aerosols (mists, fumes), generated by the material during the course of normal handling, may be harmful.

CHRONIC HEALTH EFFECTS

■ Exposure to high levels of, or prolonged exposure to chlorobenzene may cause liver damage, chronic respiratory disease and changes to the kidney (urine may be burgundy red).

Workers exposed to chlorobenzene vapours from 1-2 years reported headache, dizziness, somnolence, and dyspeptic disorders. Other symptoms included acroparaesthesia, spastic contractions of the finger muscles, hypoesthesia, spastic contractions of the gastrocnemius muscle and vasovegetative instability.

Repeated exposure of rats, rabbits and guinea pigs to chlorobenzene at 1000 ppm, 7 hours/day, 5 days/week over 44 days resulted in lung, liver and kidney changes.

Male rats receiving high doses during chronic gavage studies showed an increase in the occurrence of neoplastic nodules of the liver.

Repeated or long-term occupational exposure is likely to produce cumulative health effects involving organs or biochemical systems.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
chlorobenzene	108-90-7	>95

Section 4 - FIRST AID MEASURES

SWALLOWED

· IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY. · Where Medical attention is not immediately available or where the patient is more than 15 minutes from a hospital or unless instructed otherwise:

EYE

■ If this product comes in contact with the eyes: · Wash out immediately with fresh running water. · Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

SKIN

■ If skin contact occurs: · Immediately remove all contaminated clothing, including footwear · Flush skin and hair with running water (and soap if available).

INHALED

· If fumes or combustion products are inhaled remove from contaminated area. · Lay patient down. Keep warm and rested.

NOTES TO PHYSICIAN

■ Treat symptomatically.

The material may induce methemoglobinemia following exposure.

· Initial attention should be directed at oxygen delivery and assisted ventilation if necessary. Hyperbaric oxygen has not demonstrated substantial benefits.

· Hypotension should respond to Trendelenburg's position and intravenous fluids; otherwise dopamine may be needed.

Chlorobenzenes are readily adsorbed from the gastrointestinal tract; they are distributed into highly perfused tissues and accumulate in lipid tissues. Lipid accumulation is greatest for the more highly chlorinated chlorobenzene compounds. Chlorobenzenes are metabolised by microsomal oxidation to form arene oxide intermediates and then further to their corresponding chlorophenols which are excreted in the urine as mercapturic acids after conjugation with glutathione or as glucuronic acid or sulfate conjugates. A small percentage are eliminated unchanged in expired air or faeces.

For ingestion, consider gastric lavage.

Chlorobenzene administered orally is mainly excreted in the urine with 32% appearing in the first 24 hours mostly as metabolites (4-chlorophenylmercapturic acid, chlorophenols, chlorocatechols and mandelic acid)

Periodic medical examinations are recommended for occupationally exposed workers. [I.L.O. Encyclopaedia]

Persons with pre-existing skin disorders or impaired liver, kidney or pulmonary function may be more susceptible to the effects of this substance.

[CCINFO-MALLINCKRODT]

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	9.001 @ 20 C
Upper Explosive Limit (%):	7.1
Specific Gravity (water=1):	1.11
Lower Explosive Limit (%):	1.3

EXTINGUISHING MEDIA

· Water spray or fog.

· Foam.

FIRE FIGHTING

· Alert Emergency Responders and tell them location and nature of hazard.

· May be violently or explosively reactive.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 1000 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

· Liquid and vapor are flammable.

· Moderate fire hazard when exposed to heat or flame.

Combustion products include: carbon dioxide (CO₂), carbon monoxide (CO), hydrogen chloride, phosgene, other pyrolysis products typical of burning organic material.

FIRE INCOMPATIBILITY

■ Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Gloves:

1.VITON 2.TEFLON 3.PVA

Respirator:

Type A Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

· Remove all ignition sources.

· Clean up all spills immediately.

Wash spill site with soda solution.

MAJOR SPILLS

- Clear area of personnel and move upwind.
 - Alert Emergency Responders and tell them location and nature of hazard.
- After clean up operations, decontaminate and launder all protective clothing and equipment before storing and re-using.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of overexposure occurs.

RECOMMENDED STORAGE METHODS

- Avoid contact with aluminium and its alloys (including storage containers). Formation of aluminium chloride may catalyse further self-accelerating attack on the metal (Friedel-Crafts reaction) leading to violent explosion.

Glass container.

Packing as supplied by manufacturer. Plastic containers may only be used if approved for flammable liquid.

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- For low viscosity materials (i): Drums and jerricans must be of the non-removable head type. (ii): Where a can is to be used as an inner package, the can must have a screwed enclosure.

- For materials with a viscosity of at least 2680 cSt. (23 deg. C).

STORAGE REQUIREMENTS

- Store in original containers in approved flammable liquid storage area.
- DO NOT store in pits, depressions, basements or areas where vapors may be trapped.
- Outside or detached storage is preferred.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Notes
Canada - Ontario Occupational Exposure Limits	chlorobenzene (Chlorobenzene)	10				
US - Minnesota Permissible Exposure Limits (PELs)	chlorobenzene (Chlorobenzene)	75	350			
US ACGIH Threshold Limit Values (TLV)	chlorobenzene (Chlorobenzene)	10				TLV Basis: liver damage. BEI
Canada - Alberta Occupational Exposure Limits	chlorobenzene (Chlorobenzene)	10	46			
Canada - British Columbia Occupational Exposure Limits	chlorobenzene (Chlorobenzene)	10				
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	chlorobenzene (Chlorobenzene)	75	350			
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	chlorobenzene (Chlorobenzene)	75	350			
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	chlorobenzene (Chlorobenzene)	75	350			
US - California Permissible Exposure Limits for Chemical Contaminants	chlorobenzene (Chlorobenzene; monochlorobenzene)	10	46			

US - Idaho - Limits for Air Contaminants	chlorobenzene (Chlorobenzene)	75	350		
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	chlorobenzene (Chlorobenzene (Monochlorobenzene))	10		15	
US - Hawaii Air Contaminant Limits	chlorobenzene (Chlorobenzene)	75	350		
US - Alaska Limits for Air Contaminants	chlorobenzene (Chlorobenzene)	75	350		
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	chlorobenzene (Chlorobenzene (Monochlorobenzene))	75	350	75	350
US - Washington Permissible exposure limits of air contaminants	chlorobenzene (Chlorobenzene (Monochlorobenzene))	75		113	
US - Washington Permissible exposure limits of air contaminants	chlorobenzene (Monochlorobenzene (Chlorobenzene))	75		113	
Canada - Prince Edward Island Occupational Exposure Limits	chlorobenzene (Chlorobenzene)	10			TLV Basis: liver damage. BEI
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	chlorobenzene (Chlorobenzene)	75	350		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	chlorobenzene (Chlorobenzene)	50	230		
US - Michigan Exposure Limits for Air Contaminants	chlorobenzene (Chlorobenzene)	75	350		
US - Oregon Permissible Exposure Limits (Z-1)	chlorobenzene (Chlorobenzene)	75	350		
Canada - Nova Scotia Occupational Exposure Limits	chlorobenzene (Chlorobenzene)	10			TLV Basis: liver damage. BEI
US OSHA Permissible Exposure Levels (PELs) - Table Z1	chlorobenzene (Chlorobenzene)	75	350		
Canada - Northwest Territories Occupational Exposure Limits (English)	chlorobenzene (Chlorobenzene (Monochlorobenzene))	75	345	115	520

ENDOELTABLE

PERSONAL PROTECTION



RESPIRATOR

Type A Filter of sufficient capacity

Consult your EHS staff for recommendations

EYE

- Safety glasses with side shields
- Chemical goggles.

HANDS/FEET

- Wear chemical protective gloves, eg. PVC.

Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:

- frequency and duration of contact,
- chemical resistance of glove material,
- glove thickness and
- dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.

- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.

- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

- Neoprene gloves.

OTHER

- Overalls.
- PVC Apron.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

ENGINEERING CONTROLS

- For flammable liquids and flammable gases, local exhaust ventilation or a process enclosure ventilation system may be required. Ventilation equipment should be explosion-resistant.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Does not mix with water.

Sinks in water.

State	Liquid	Molecular Weight	112.56
Melting Range (°F)	-50.08	Viscosity	Not Available
Boiling Range (°F)	267.8- 275	Solubility in water (g/L)	Immiscible
Flash Point (°F)	84.2	pH (1% solution)	Not applicable.
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	1180.4	Vapor Pressure (mmHg)	9.001 @ 20 C
Upper Explosive Limit (%)	7.1	Specific Gravity (water=1)	1.11
Lower Explosive Limit (%)	1.3	Relative Vapor Density (air=1)	3.9
Volatile Component (%vol)	approx. 100	Evaporation Rate	Not available
Gas group	IIA		

- log Kow (Prager 1995): 2.18- 2.84 ■ log Kow (Sangster 1997): 2.84

CHLOROBENZENE

APPEARANCE

A clear, colourless, volatile, flammable liquid with a faint, almond- like, aromatic odour. It is a very refractive liquid (1.528); immiscible with water but freely miscible with in alcohol, benzene, chloroform and ether. Environmental pollutant.

log Kow 2.13-3.0

Material	Value
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Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

- Presence of elevated temperatures.
- Presence of incompatible materials.
- Product is considered stable.

STORAGE INCOMPATIBILITY

■ Chlorobenzene

- reacts violently, possibly explosively, with strong oxidisers, alkali metals, nitric acid, dimethylsulfoxide, powdered sodium, silver perchlorate (forms shock-sensitive solvated salts)
- may generate electrostatic charges
- attacks some plastics, rubber and coatings.

Avoid extreme humidity.

- Haloaryl compounds, though normally not very reactive, may be sufficiently activated by other substituents or by a few specific reaction conditions, to undergo violent reactions.

BREITHERICK L.: Handbook of Reactive Chemical Hazards.

- Avoid contact with aluminium and its alloys (including storage containers). Formation of aluminium chloride may catalyse further self-accelerating attack on the metal (Friedel-Crafts reaction) leading to violent explosion.

Avoid reaction with oxidizing agents.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

CHLOROBENZENE

TOXICITY AND IRRITATION

- unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

TOXICITY	IRRITATION
Oral (rat) LD50: >2290 mg/kg	Nil Reported
Oral (rat) LD50: 1100 mg/kg* *[Merck]	

Inhalation (rat) LCLo: 9000 ppm

- During the manufacture and use of chlorobenzenes, clinical symptoms and signs of excessive exposure include: central nervous system effects and irritation of the eyes and upper respiratory tract (MCB); haematological disorders (1,2-DCB); and central nervous system effects, hardening of the skin, and haematological disorders including anaemia (1,4-DCB).

All chlorobenzenes appear to be absorbed readily from the gastrointestinal and respiratory tracts in humans and experimental animals, with absorption influenced by the position of the chlorine in different isomers of the same congener. The chlorobenzenes are less readily absorbed through the skin. After rapid distribution to highly perfused organs in experimental animals, absorbed chlorobenzenes accumulate primarily in the fatty tissue, with smaller amounts in the liver and other organs. Chlorobenzenes have been shown to cross the placenta, and have been found in the foetal brain. In general, accumulation is greater for the more highly chlorinated congeners. There is considerable variation, however, in the accumulation of different isomers of the same congener. In both humans and experimental animals, the metabolism of chlorobenzenes proceeds via microsomal oxidation to the corresponding chlorophenol. These chlorophenols can be excreted in the urine as mercapturic acids, or as glucuronic acid or sulfate conjugates. Tetrachlorobenzenes (TeCB) and pentachlorobenzene (PeCB) are metabolized at a slower rate and remain in the tissues for longer periods than the monochloro- to trichloro- congeners. Some of the chlorobenzenes induce a wide range of enzyme systems including those involved in oxidative, reductive, conjugation, and hydrolytic pathways. In general, elimination of the higher chlorinated benzenes is slower than that of the MCB and DCB congeners, and a greater proportion of the tri- to penta- congeners are eliminated unchanged in the faeces.

With few exceptions, the chlorobenzenes are only moderately toxic for experimental animals, on an acute basis, and, generally, have oral LD50s greater than 1000 mg/kg body weight; from the limited data available, dermal LD50s are higher. The ingestion of a lethal dose leads to respiratory paralysis, while the inhalation of high doses causes local irritation and depression of the central nervous system. Acute exposures to non-lethal doses of chlorobenzenes induce toxic effects on the liver, kidneys, adrenal glands, mucous membranes, and brain, and effects on metabolizing enzymes. Studies on skin and eye irritation caused by chlorobenzenes have been restricted to 1,2,4-TCB and 1,2-DCB. Both produce severe discomfort, but no permanent damage was noted after direct application to the rabbit eye. 1,2,4-TCB is mildly irritating to the skin and may lead to dermatitis after repeated or prolonged contact. No evidence of sensitization was found. Short-term exposures (5-21 days) of rats and mice to MCB and DCBs at hundreds of mg/kg body weight resulted in liver damage and haematological changes indicative of bone marrow damage. Liver damage was also the major adverse effect noted after the short-term exposure of rats or rabbits to other chlorobenzenes (TCB-PeCB), at doses slightly lower than those for MCB and DCBs. Several of the chlorobenzene isomers studied induced porphyria, the isomers with para chlorine atoms being the most active (i.e., 1,4-DCB, 1,2,4-TCB, 1,2,3,4-TeCB, and PeCB). The general order of toxicity noted for TeCBs and PeCB after short-term exposure was: 1,2,4,5-TeCB > PeCB > 1,2,3,4- and 1,2,3,5-TeCB, which correlated well with the levels found in fat and liver.

Long-term exposure studies (up to 6 months) on several species of experimental animals indicated a trend for the toxicity of chlorobenzenes to increase with increased ring chlorination. However, there was considerable variation in the long-term toxicities of different isomers of the same congener. For example, 1,4-DCB appeared to be much less toxic than 1,2-DCB. There was a good correlation between toxicity and the degree of accumulation of the compound in the body tissues, female animals being less sensitive than males. Major target organs were the liver and kidney; at higher doses, effects on the haematopoietic system were reported and thyroid toxicity was noted in studies on 1,2,4,5-TeCB and PeCB.

There has been no evidence that chlorobenzenes are teratogenic in rats and rabbits. High doses produce embryotoxic and fetotoxic effects. However, such doses were clearly toxic to the mother. Although there is some evidence that TCBs, TeCBs, and PeCB are embryotoxic and fetotoxic at doses that are not toxic for the mother, available data are inconsistent.

Mammalian somatic cell mutagen

NTP Carcinogenesis studies indicate some positive findings for rat following administration by gavage.

REPROTOXIN

chlorobenzene	ILO Chemicals in the electronics industry that have toxic effects on reproduction	Reduced fertility or sterility	A
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SKIN

Section 12 - ECOLOGICAL INFORMATION

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

This material and its container must be disposed of as hazardous waste.

Avoid release to the environment.

Refer to special instructions/ safety data sheets.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
chlorobenzene	MED	HIGH	LOW	MED

GESAMP/EHS COMPOSITE LIST - GESAMP Hazard Profiles

Name / EHS TRN A1a A1b A1 A2 B1 B2 C1 C2 C3 D1 D2 D3 E1 E2 E3 Cas No / RTECS No _____
 _____ Chloroben 456 185 2 2 2 NR 3 0 1 0 2 2 0 S 2 zene / CAS:108- 90- 7 / CZ0175000

Legend: EHS=EHS Number (EHS=GESAMP Working Group on the Evaluation of the Hazards of Harmful Substances Carried by Ships)
 NRT=Net Register Tonnage, A1a=Bioaccumulation log Pow, A1b=Bioaccumulation BCF, A1=Bioaccumulation, A2=Biodegradation,
 B1=Acuteaquatic toxicity LC/ECIC50 (mg/l), B2=Chronic aquatic toxicity NOEC (mg/l), C1=Acute mammalian oral toxicity LD50 (mg/kg),
 C2=Acute mammalian dermal toxicity LD50 (mg/kg), C3=Acute mammalian inhalation toxicity LC50 (mg/kg), D1=Skin irritation & corrosion,
 D2=Eye irritation & corrosion, D3=Long-term health effects, E1=Tainting, E2=Physical effects on wildlife & benthic habitats, E3=Interference
 with coastal amenities, For column A2: R=Readily biodegradable, NR=Not readily biodegradable. For column D3: C=Carcinogen,
 M=Mutagenic, R=Reprotoxic, S=Sensitising, A=Aspiration hazard, T=Target organ systemic toxicity, L=Lung injury, N=Neurotoxic,
 I=Immunotoxic. For column E1: NT=Not tainting (tested), T=Tainting test positive. For column E2: Fp=Persistent floater, F=Floater, S=Sinking
 substances. The numerical scales start from 0 (no hazard), while higher numbers reflect increasing hazard. (GESAMP/EHS Composite List
 of Hazard Profiles - Hazard evaluation of substances transported by ships)

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

Toxicity characteristic: use EPA hazardous waste number D021 (waste code E) if
 this substance, in a solid waste, produces an extract containing greater than
 100 mg/L of Chlorobenzene.

B. Component Waste Numbers

When chlorobenzene is present as a solid waste as a discarded commercial
 chemical product, off-specification species, as a container residue, or a spill
 residue, use EPA waste number U037 (waste code T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

! Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in
 their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been
 contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be
 applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be
 appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility
 can be identified.

Section 14 - TRANSPORTATION INFORMATION



DOT:
Symbols: None Hazard class or Division: 3
Identification Numbers: UN1134 PG: III
Label Codes: 3 Special provisions: B1, IB3,
T2, TP1
Packaging: Exceptions: 150 Packaging: Non- bulk: 203
Packaging: Exceptions: 150 Quantity limitations: 60 L
Passenger aircraft/rail:
Quantity Limitations: Cargo 220 L Vessel stowage: Location: A
aircraft only:
Vessel stowage: Other: None
Hazardous materials descriptions and proper shipping names:
Chlorobenzene

Air Transport IATA:

ICAO/IATA Class: 3 ICAO/IATA Subrisk: None
UN/ID Number: 1134 Packing Group: III
Special provisions: None
Cargo Only
Packing Instructions: 310 Maximum Qty/Pack: 220 L
Passenger and Cargo Passenger and Cargo
Packing Instructions: 309 Maximum Qty/Pack: 60 L
Passenger and Cargo Limited Quantity Passenger and Cargo Limited Quantity
Packing Instructions: Y309 Maximum Qty/Pack: 10 L
Shipping Name: CHLOROBENZENE

Maritime Transport IMDG:

IMDG Class: 3 IMDG Subrisk: None
UN Number: 1134 Packing Group: III
EMS Number: F-E , S-D Special provisions: None
Limited Quantities: 5 L Marine Pollutant: Yes
Shipping Name: CHLOROBENZENE

Section 15 - REGULATORY INFORMATION



REGULATIONS

chlorobenzene (CAS: 108-90-7) is found on the following regulatory lists;

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits - Carcinogens", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Industrial Hazardous Substances", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Environmental Quality Guidelines (EQGs) Water: Aquatic life", "Canada Environmental Quality Guidelines (EQGs) Water: Community", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Priority Substances List (PSL1, PSL 2)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "GESAMP/EHS Composite List - GESAMP Hazard Profiles", "IMO IBC Code Chapter 17: Summary of minimum requirements", "IMO MARPOL 73/78 (Annex II) - List of Noxious Liquid Substances Carried in Bulk", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Code of Regulation; Identification and Listing of Hazardous Waste, Table 1 - Maximum Concentrations for the Toxicity Characteristics", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Permissible Exposure Limits (Z-1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Hazardous Constituents", "US - Vermont Hazardous Waste - Maximum Contaminant Concentration for Toxicity", "US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Dangerous waste constituents list", "US - Washington Discarded Chemical Products List - ""U"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US ACGIH Threshold Limit Values (TLV) - Carcinogens", "US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)", "US CAA (Clean Air Act) - HON Rule - Organic HAPs (Hazardous Air Pollutants)", "US CERCLA Priority List of Hazardous Substances", "US Clean Air Act - Hazardous Air Pollutants", "US CWA (Clean Water Act) -

List of Hazardous Substances", "US CWA (Clean Water Act) - Priority Pollutants", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGs) - Interim", "US EPA Carcinogens Listing", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks", "US EPA Voluntary Children's Chemical Evaluation Program (VCCEP)", "US EPCRA Section 313 Chemical List", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act", "US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide", "US RCRA (Resource Conservation & Recovery Act) - Appendix IX to Part 264 Ground-Water Monitoring List 1", "US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Inorganic and Organic Constituents 1", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards", "US -Texas Air Monitoring Comparison Values for Evaluating Carbonyls", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 12(b) - List of Chemical Substances Subject to Export Notification Requirements", "US TSCA Section 4 - HDD/HDF - Precursors Required to Be Reported", "US TSCA Section 4/12 (b) - Sunset Date/Status", "US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List", "US TSCA Section 8 (d) - Health and Safety Data Reporting", "WHO Guidelines for Drinking-water Quality - Chemicals for which guideline values have not been established"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Skin contact may produce health damage*.
- Cumulative effects may result following exposure*.

* (limited evidence).

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- Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:

www.chemwatch.net/references.

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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