

β -Mercaptoethanol

sc-202966



The Power to Question

Material Safety Data Sheet

Hazard Alert Code
Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

β -Mercaptoethanol

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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Santa Cruz, California 95060
800.457.3801 or 831.457.3800

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

C2-H6-O-S, HSCH₂CH₂OH, "ethanol, 2-mercapto-", 1-ethanol-2-thiol, "ethylene glycol, monothio-", 2-hydroxy-1-ethanethiol, "2-hydroxyethyl mercaptan", mercaptoethanol, beta-mercaptoethanol, monothioethyleneglycol, 2-thioethanol, thioglycol, thiomonoglycol, "USAF EK-4196", "Emery 5791", 2-ME, "thioethylene glycol"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

		Min	Max
Flammability	1		
Toxicity	3		
Body Contact	3		
Reactivity	1		
Chronic	2		

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



CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful by inhalation.

Risk of serious damage to eyes.

May cause SENSITISATION by skin contact.

HARMFUL - May cause lung damage if swallowed.

Toxic in contact with skin and if swallowed.

Irritating to respiratory system and skin.

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

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

■ Toxic effects may result from the accidental ingestion of the material; animal experiments indicate that ingestion of less than 40 gram may be fatal or may produce serious damage to the health of the individual.

■ Swallowing of the liquid may cause aspiration into the lungs with the risk of chemical pneumonitis; serious consequences may result.

(ICSC13733).

■ In rats poisoned by oral administration, of 2-mercaptoethanol, pharmacotoxic signs included hypoactivity, ruffed fur, rapid breathing, muscular weakness, tremors, convulsions, prostration and cyanosis.

Higher doses exerted a toxic effect within minutes, characteristic of central nervous system stimulation.

EYE

■ If applied to the eyes, this material causes severe eye damage.

■ Exposure to H₂S may produce pain, blurred vision, and irritation.

These symptoms are temporary in all but severe cases.

SKIN

■ Skin contact with the material may produce toxic effects; systemic effects may result following absorption.

■ This material can cause inflammation of the skin on contact in some persons.

■ The material may accentuate any pre-existing dermatitis condition.

■ 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.

■ Pharmacotoxic signs in rabbits poisoned following skin absorption of 2-mercaptoethanol include depression, anorexia, salivation, tremors and laboured breathing.

INHALED

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

■ The material can cause respiratory irritation in some persons.

The body's response to such irritation can cause further lung damage.

■ Thiols (particularly ethyl mercaptan) produce lethargy or sleepiness.

Exposure to high levels may result in nausea, vomiting, restlessness, muscle incoordination and or paralysis, bluing of skin, depression of breathing, coma and death.

■ Prolonged exposure may cause headache, nausea and ultimately loss of consciousness.

■ Hydrogen sulfide poisoning can cause increased secretion of saliva, nausea, vomiting, diarrhea, giddiness, headache, vertigo, memory loss, palpitations, heartbeat irregularities, weakness, muscle cramps, confusion, sudden collapse, unconsciousness and death due to paralysis of breathing (at levels above 300 parts per million). The "rotten egg" odor is not a good indicator of exposure since odor fatigue occurs and odor is lost at over 200 ppm.

■ Low concentrations of 2-mercaptoethanol may produce headache and nausea.

High concentrations may cause coughing, wheezing, shortness of breath, a burning sensation, laryngitis and vomiting.

CHRONIC HEALTH EFFECTS

■ Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Skin contact with the material is more likely to cause a sensitization reaction in some persons compared to the general population.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

Long term low level exposure to hydrogen sulfide may produce headache, fatigue, dizziness, irritability and loss of sexual desire. These symptoms may also result when exposed to hydrogen sulfide at high concentration for a short period of time.

Chronic exposure to mercaptans may result in damage to the lungs, kidneys and liver.

Rats exposed by inhalation to 2-mercaptoethanol for 6-months to 3 ppm showed neuromuscular depression, lymphopenia, neutrophilia and decreased oxygen consumption in the third month. In the fifth month, variations of weight, arterial blood pressure, liver function and protein metabolism were found.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
2-mercaptoethanol	60-24-2	>95
may form		
hydrogen sulfide	7783-06-4	

Section 4 - FIRST AID MEASURES

SWALLOWED

- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.
- Avoid giving milk or oils.
- Avoid giving alcohol.
- If spontaneous vomiting appears imminent or occurs, hold patient's head down, lower than their hips to help avoid possible aspiration of vomitus.

EYE

If this product comes in contact with the eyes

- Immediately hold eyelids apart and flush the eye continuously with 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 or hair contact occurs

- Quickly but gently, wipe material off skin with a dry, clean cloth.
- Immediately remove all contaminated clothing, including footwear.

INHALED

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

NOTES TO PHYSICIAN

■ Any material aspirated during vomiting may produce lung injury. Therefore emesis should not be induced mechanically or pharmacologically.

For exposures involving sulfides and hydrogen sulfide (including gastric acid decomposition products of alkaline sulfides).

- Hydrogen sulfide anion produces its major toxic effect through inhibition of cytochrome oxidases.
- Symptoms include profuse salivation, nausea, vomiting and diarrhea. Central nervous effects may include

giddiness, headache, vertigo, amnesia, confusion and unconsciousness. Tachypnea, palpitation, tachycardia, arrhythmia, sweating, weakness and muscle cramps may also indicate over-exposures. Metabolised by alcohol dehydrogenase to mercaptoacetic acid and in vitro by cysteamine oxygenase to isethenic acid and isethionic acid.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg)	0.998 @ 20 C
Upper Explosive Limit (%)	18
Specific Gravity (water=1)	1.114
Lower Explosive Limit (%)	2.3

EXTINGUISHING MEDIA

- Water spray or fog.
- Foam.

FIRE FIGHTING

- Alert Emergency Responders and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.

When any large container (including road and rail tankers) is involved in a fire, consider evacuation by 800 metres in all directions.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

- Combustible.
- Slight fire hazard when exposed to heat or flame.

Combustion products include carbon dioxide (CO₂), sulfur oxides (SO_x), other pyrolysis products typical of burning organic material.

May emit poisonous fumes.

FIRE INCOMPATIBILITY

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

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Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

WARNING Never use dry, powdered hypochlorite or other strong oxidizer for mercaptan spills, as autoignition can occur.

- Remove all ignition sources.
- Clean up all spills immediately.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin

The careful design and assembly of equipment is paramount to the control of mercaptan odors. Although careful planning reduces the chances for leaks developing in the system, it is important to be prepared to locate and stop small leaks promptly. It is recommended that a leak check be made prior to every run carried out under pressure in metal equipment with a mercaptan or hydrogen sulfide present.

An effective method to obtain a leak-free system involves two steps

- Charge the system with nitrogen gas or other inert, nontoxic gas to a pressure at least as high as will be used in practice, and check for a drop in pressure with time on a suitable gauge. In some cases, it is advantageous to block off sections of the system to facilitate finding the leak. If any leaks are detected by using a foaming detergent solution, correct them and recheck.
- Recharge the system with hydrogen sulfide gas. Since hydrogen sulfide is very toxic, it is good practice to charge the system in steps of increasing pressure, until it is certain that no large leaks are present. Any remaining small leaks can be located quickly by examining the system with lead acetate paper. Dilution of the hydrogen sulfide with nitrogen can also be considered.

To control odors in mercaptan reactions in the laboratory. All reactions must be carried out in a hood or, in the case of pressure reactions, in a closed in area equipped with an efficient exhaust fan. In the laboratory, the two basic types of reactions used are batch and continuous. Batch-type reactions at atmospheric pressure are generally conducted in glass equipment. If no significant quantity of a volatile mercaptan is present, the reaction can be carried out in a hood equipped with a charcoal bed in the exhaust line to absorb the mercaptan. In reactions where appreciable quantities of a volatile mercaptan are present, a vent gas line can be connected to two caustic scrubbers in series, with an empty trap inserted between the reaction and scrubbers to avoid reverse flow of caustic into the reaction. Continuous-type reactions often include a continuous flow of volatile C1 to C4 mercaptans. In this case, the vented gases can be fed to an outside gas burner and stack for destruction of the odor by combustion.

A hood, equipped with a charcoal filter in the exhaust line, and a high linear air velocity (100 ft./min., minimum) is necessary for mercaptan reactions carried out in glass and certain small-scale reactions with stainless-steel. In reactions where relatively small amounts of mercaptans can escape, the charcoal bed can absorb the mercaptans and prevent the escape of odor to the outside atmosphere. However, in reactions with hydrogen sulfide or lower molecular weight mercaptans, e.g., C1-C4 mercaptans, the quantity of effluent gases is directed to an outside gas burner to convert the odorous compounds to acceptable combustion products, including CO₂ and SO₂.

A very familiar and successful method for containing the odors of mercaptan (primarily C1 and C6) in laboratory reactions and distillations is to connect the condenser vent to two caustic scrubbers in series with an empty trap between the system and the scrubbers to catch the caustic in the event of reverse flow. Gas bubblers fitted with sintered-glass dip tubes and charged with aqueous sodium hydroxide (5 to 20%) are commonly used. Frequently, a low flow of inert gas, e.g., nitrogen, is used to maintain a steady flow through the bubbler.

Sodium hypochlorite solution (3-10%) destroys the odor by converting the mercaptan predominantly to the corresponding sulfonic acid (sodium salt). A wash bottle with hypochlorite solution is very convenient for quickly eliminating or controlling the odor from small spills or when cleaning up glass equipment. A bath of this solution is also very useful. **WARNING!** Do not add this solution to a large quantity of concentrated mercaptan, since a violent reaction may occur.

A 30-40% aqueous solution of lead acetate trihydrate serves acts as a detector for methyl and ethyl mercaptan as well as hydrogen sulfide. A wash bottle of lead acetate solution is used to moisten a piece of filter paper or paper towel which is then held close to (no contact) the suspected leak. With hydrogen sulfide the paper turns black and with the two mercaptans a yellow color is obtained (high sensitivity).

A large plastic bag should be kept in the hood, to store any odorous waste materials. The plastic bags can then be sealed in fiber drums for disposal. Glass bottles containing mercaptans and other odorous compounds can also be packed in fiber drums for odor-containment and properly marked for disposal.

A box of disposable gloves should be available, and the gloves should be discarded (in plastic bag in hood) after each use. Disposable aprons or lab coats are recommended, since clothing contacted with mercaptan is often difficult to deodorise.

Types of tubing found useful with mercaptans include Teflon[®], TFE, FEP, and PFA, Bev-a-line (IV or V), and 316 stainless steel. Bev-a-line tubing has a polyethylene liner cross-linked to an ethylene vinyl acetate shell, a useful temperature range of -60 C to +250 C, and is heat bondable. It is less expensive than TFE tubing and is convenient for flexible connections between glass and metal tubing lines. It is available from most laboratory supply houses. Copper and brass are unacceptable materials for handling mercaptans, because mercaptans are H₂S are highly corrosive to copper and brass. Care should be taken not to use valves and gauges with brass components.

Atofina Chemicals.

- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.

RECOMMENDED STORAGE METHODS

- Lined metal can, Lined metal pail/drum
- Plastic pail

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
- Where a can is to be used as an inner package, the can must have a screwed enclosure.

Should be stored in glass-lined or polyethylene lined container or polyethylene lined containers to avoid contamination by metals.

STORAGE REQUIREMENTS

- Store in original containers.
- Keep containers securely sealed.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m ³	STEL ppm	STEL mg/m ³	Peak ppm	Peak mg/m ³	TWA F/CC	Notes
US AIHA Workplace Environmental Exposure Levels (WEELs)	2-mercaptoethanol (Mercaptoethanol)	0.2							skin
US - Minnesota Permissible Exposure Limits (PELs)	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21				
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	hydrogen sulfide (HYDROGEN SULFIDE)	0.07							
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	hydrogen sulfide (HYDROGEN SULFIDE)	0.02							
Canada - British Columbia Occupational Exposure Limits	hydrogen sulfide (Hydrogen sulfide)					10			
US ACGIH Threshold Limit Values (TLV)	hydrogen sulfide (Hydrogen sulfide)	1		5					TLV Basis upper respiratory tract irritation; central nervous system impairment

US NIOSH Recommended Exposure Limits (RELs)	hydrogen sulfide (Hydrogen sulfide)	10	15	(Ceiling ([10-minute]))		
Canada - Alberta Occupational Exposure Limits	hydrogen sulfide (Hydrogen sulphide)	10	14	15	21	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21	
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	hydrogen sulfide (Hydrogen sulfide)	See Table Z-2				
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21	20
US - Idaho - Acceptable Maximum Peak Concentrations	hydrogen sulfide (Hydrogen sulfide (Z37.2-1966))	20				
US - California Permissible Exposure Limits for Chemical Contaminants	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21	50
US - Idaho - Limits for Air Contaminants	hydrogen sulfide (Hydrogen sulfid)	[2]				
US OSHA Permissible Exposure Levels (PELs) - Table Z2	hydrogen sulfide (Hydrogen sulfide (Z37.2-1966))	20				
US - Alaska Limits for Air Contaminants	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21	
US - Michigan Exposure Limits for Air Contaminants	hydrogen sulfide (Hydrogen sulphide)	10	14	15	21	
US - Hawaii Air Contaminant Limits	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	hydrogen sulfide (Hydrogen sulphide)	10	15	15	27	
US - Washington Permissible exposure limits of air contaminants	hydrogen sulfide (Hydrogen sulfide)	10	15			

Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	hydrogen sulfide (Hydrogen sulphide)	10		15				
Canada - Northwest Territories Occupational Exposure Limits (English)	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21	20	28	
US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	hydrogen sulfide (Hydrogen sulfide (Z37.2-1966))					20		
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	hydrogen sulfide (Hydrogen sulfide)	10	14	15	21			
US - Oregon Permissible Exposure Limits (Z-2)	hydrogen sulfide (Hydrogen sulfide (Z37.2-1966))					20		
Canada - Nova Scotia Occupational Exposure Limits	hydrogen sulfide (Hydrogen sulfide)	10		15				
Canada - Prince Edward Island Occupational Exposure Limits	hydrogen sulfide (Hydrogen sulfide)	1		5				TLV Basis upper respiratory tract irritation; central nervous system impairment

PERSONAL PROTECTION



RESPIRATOR

•Type AB Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 1432000 & 1492001, ANSI Z88 or national equivalent)

EYE

- Safety glasses with side shields.
- Chemical goggles.

HANDS/FEET

Wear chemical protective gloves, eg. PVC.

NOTE The material may produce skin sensitization in predisposed individuals. Care must be taken, when

removing gloves and other protective equipment, to avoid all possible skin contact.

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

- 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, AS/NZS 2161.1 or national equivalent).

- 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, AS/NZS 2161.10.1 or national equivalent) 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, AS/NZS 2161.10.1 or national equivalent) 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.

OTHER

- Overalls.
- Eyewash unit.

ENGINEERING CONTROLS

Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Mixes with water.

State	Liquid	Molecular Weight	78.1
Melting Range (°F)	<-58	Viscosity	3.81 cSt@40°C
Boiling Range (°F)	315(decomposes)	Solubility in water (g/L)	Miscible
Flash Point (°F)	154	pH (1% solution)	4.5-6 (500 g/l, 20 C)
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapor Pressure (mmHg)	0.998 @ 20 C
Upper Explosive Limit (%)	18	Specific Gravity (water=1)	1.114
Lower Explosive Limit (%)	2.3	Relative Vapor Density (air=1)	2.69
Volatile Component (%vol)	Negligible	Evaporation Rate	Not available

APPEARANCE

Liquid with unpleasant smell; mixes with water (500 g/l).

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

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

STORAGE INCOMPATIBILITY

2-Mercaptoethanol

- reacts violently with strong oxidisers
- is incompatible with strong acids, caustics, aliphatic amines. isocyanates

Hydrogen sulfide (H₂S)

- is a highly flammable and reactive gas
- reacts violently with strong oxidisers, metal oxides, metal dusts and powders, bromine pentafluoride, chlorine trifluoride, chromium trioxide, chromyl chloride, dichlorine oxide, nitrogen trichloride, nitryl hypofluorite, oxygen difluoride, perchloryl fluoride, phospham, phosphorus persulfide, silver fulminate, soda-lime, sodium peroxide
- is incompatible with acetaldehyde, chlorine monoxide, chromic acid, chromic anhydride, copper, nitric acid, phenyldiazonium chloride, sodium
- forms explosive material with benzenediazonium salts
- attacks many metals

Flow or agitation of hydrogen sulfide may generate electrostatic charges due to low conductivity.

Avoid reaction with oxidizing agents, bases and strong reducing agents.

Avoid contact with alkali metals.

Keep dry.

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

Section 11 - TOXICOLOGICAL INFORMATION

2-mercaptoethanol

TOXICITY AND IRRITATION

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

2-MERCAPTOETHANOL

TOXICITY	IRRITATION
Oral (rat) LD50 244 mg/kg	Skin (rabbit) 10 mg/24h (open)
Inhalation (mouse) LC50 13200 mg/m ³	Eye (rabbit) 1 mg - SEVERE
Dermal (rabbit) LD50 150 mg/kg	
Oral (Rat) LD50 131 mg/kg *	
Dermal (Rabbit) LD50 251 mg/kg *	
Inhalation (Rat) LC50 2000 mg/m ³ /4h *	

Contact allergies quickly manifest themselves as contact eczema, more rarely as urticaria or Quincke's edema. The pathogenesis of contact eczema involves a cell-mediated (T lymphocytes) immune reaction of the delayed type.

Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Tremors, convulsion, excitement, spasticity, respiratory depression recorded.

Genetic Toxicity AMES - Negative; Mouse Lymphoma Forward Mutation Assay - Negative; In Vitro Sister Chromatid Exchange - Negative *

*Chevron Philips MSDS

Genetic toxicity Results from a number of genotoxicity studies with microorganisms, mammalian cell culture and mammals are available. Taking into account all of the information, there is no indication that the substance is genotoxic.

Reproductive toxicity The results of animal studies gave no indication of a fertility impairing effect.

The results were determined in a Screening test (OECD 421/422).

Developmental toxicity/teratogenicity A teratogenic potential cannot be excluded. The results were determined in a Screening test (OECD 421/422).

Other information Skin resorption hazard.

** BASF MSDS

TOXICITY	IRRITATION
HYDROGEN SULFIDE	
Inhalation (human) LDLo 5.7 mg/kg	Nil Reported
Inhalation (human) LCLo 600 ppm/30m	
Inhalation (human) LCLo 800 ppm/5m	

CARCINOGEN

VPVB_(VERY~ US - Maine Chemicals of High Concern List Carcinogen CA Prop 65; IARC; NTP 11th ROC
hydrogen sulfide US - Rhode Island Hazardous Substance List IARC

SKIN

2-mercaptoethanol	US AIHA Workplace Environmental Exposure Levels (WEELs) - Skin	Notes	skin
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Section 12 - ECOLOGICAL INFORMATION

Very 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.

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																
Alcohol	293	85	0	0	R	0	0	0	0	0	0	1			D	1
ic																
beverag																
es /																
CAS:60-																
24- 2																
/																

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=Lunginjury, 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

B. Component Waste Numbers

When hydrogen sulfide 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 U135 (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 or consult manufacturer for recycling options.
- Consult Waste Management Authority for disposal.

Section 14 - TRANSPORTATION INFORMATION



DOT:

Symbols:	None	Hazard class or Division:	6.1
Identification Numbers:	UN2966	PG:	II
Label Codes:	6.1	Special provisions:	IB2, T7, TP2
Packaging: Exceptions:	153	Packaging: Non-bulk:	202
Packaging: Exceptions:	153	Quantity limitations: Passenger aircraft/rail:	5 L
Quantity Limitations: Cargo aircraft only:	60 L	Vessel stowage: Location:	A
Vessel stowage: Other:	None		

Hazardous materials descriptions and proper shipping names:

Thioglycol

Air Transport IATA:

UN/ID Number:	2966	Packing Group:	II
Special provisions:	None		
Cargo Only			
Packing Instructions:	662	Maximum Qty/Pack:	60 L
Passenger and Cargo		Passenger and Cargo	

Packing Instructions:	Y641	Maximum Qty/Pack:	5 L
Passenger and Cargo Limited Quantity		Passenger and Cargo Limited Quantity	
Packing Instructions:	654	Maximum Qty/Pack:	1 L
Shipping Name: THIOGLYCOL			
Maritime Transport IMDG:			
IMDG Class:	6.1	IMDG Subrisk:	None
UN Number:	2966	Packing Group:	II
EMS Number:	F-A,S-A	Special provisions:	None
Limited Quantities:	100 ml	Marine Pollutant:	Yes
Shipping Name: THIOGLYCOL			

Section 15 - REGULATORY INFORMATION

2-mercaptoethanol (CAS: 60-24-2) is found on the following regulatory lists;

"Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "FEMA Generally Recognized as Safe (GRAS) Flavoring Substances 24 - Primary Names and Synonyms", "International Council of Chemical Associations (ICCA) - High Production Volume List", "US - Massachusetts Oil & Hazardous Material List", "US - Minnesota Hazardous Substance List", "US - Pennsylvania - Hazardous Substance List", "US AIHA Workplace Environmental Exposure Levels (WEELs)", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA High Production Volume Program Chemical List", "US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory"

Regulations for ingredients

hydrogen sulfide (CAS: 7783-06-4) is found on the following regulatory lists;

"Canada - Alberta Ambient Air Quality Objectives", "Canada - Alberta Ambient Air Quality Objectives - Other", "Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "International Council of Chemical Associations (ICCA) - High Production Volume List", "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 Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)", "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 - Acceptable Maximum Peak Concentrations", "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 Hazardous Materials", "US - Oregon Permissible Exposure Limits (Z-1)", "US - Oregon Permissible Exposure Limits (Z-2)", "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 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 List of Highly Hazardous Chemicals, Toxics and Reactives", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling

concentration for an 8-hr shift","US ACGIH Threshold Limit Values (TLV)","US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)","US CERCLA Priority List of Hazardous Substances","US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances","US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest","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) - Final","US EPA National Priorities List - Superfund Chemical Data Matrix (SCDM) - Hazard Ranking System - Hazardous Substance Benchmarks","US Food Additive Database","US List of Lists - Consolidated List of Chemicals Subject to EPCRA, CERCLA and Section 112(r) of the Clean Air Act","US NFPA 45 Fire Protection for Laboratories Using Chemicals - Flammability Characteristics of Common Compressed and Liquefied Gases","US NIOSH Recommended Exposure Limits (RELs)","US OSHA List of Highly Hazardous Chemicals, Toxics and Reactives","US OSHA Permissible Exposure Levels (PELs) - Table Z1","US OSHA Permissible Exposure Levels (PELs) - Table Z2","US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide","US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261","US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes","US SARA Section 302 Extremely Hazardous Substances","US Toxic Substances Control Act (TSCA) - Chemical Substance Inventory","USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27","WHO Guidelines for Drinking-water Quality - Chemicals for which guideline values have not been established"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

■ Cumulative effects may result following exposure*.

* (limited evidence).

Denmark Advisory list for selfclassification of dangerous substances

Substance	CAS	Suggested codes
2- mercaptoethanol	60- 24- 2	Xn; R22 R43
hydrogen sulfide	7783- 06- 4	Xn; R22 R43

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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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