

## ETHYLENE OXIDE

### Section-1 IDENTIFICATION OF THE SUBSTANCE/PREPARATION AND OF THE COMPANY/UNDERTAKING

#### 1.1 Identification of the substance/preparation:

**Commercial name:** ETHYLENE OXIDE

**Chemical name:** ETHYLENE OXIDE C<sub>2</sub>H<sub>4</sub>O

**Synonyms:** Ethoxyethane, Oxirane, Amprolene, Anprolene, Epoxyethane.

**1.2 Use of the substance /preparation:** Organic synthesis

### Section 2 – HAZARD IDENTIFICATION

#### 2.1 Classification of the substance/preparation: Hazard class and category code.

##### GHS Category:

Health	Environmental	Physical
Carcinogenicity Category: 1B Mutagenicity category: 1B Acute Toxicity Inhalation category: 3 Eye Irritation Category: 2 Specific Target Organ Toxicity SE 3 Skin Irritation Category: 2	Aquatic Toxicity – Category- NA	Flammable – Category 1

Data reference: <http://toxnet.nlm.nih.gov/cgi-bin/sis>

NA: Not available, SE: Single Exposure

## Material Safety Data Sheet

Issue Date: Aug. 01, 2013

## ETHYLENE OXIDE

Supersedes: Sep. 01, 2011

### GHS Category table for reference:

Study/hazard statement	Category 1	Category 2	Category 3	Category 4	Category 5
Acute Oral LD50	≤ 5 mg/kg Fatal if swallowed	> 5 ≤ 50 mg/kg Fatal if swallowed	> 50 ≤ 300 mg/kg Toxic if swallowed	> 300 ≤ 2000 mg/kg Harmful if swallowed	> 2000 ≤ 5000mg/kg May be harmful if swallowed
Acute Dermal LD50	≤ 50 mg/kg Fatal in contact with skin	> 50 ≤ 200 mg/kg Fatal in contact with skin	> 200 ≤ 1000 mg/kg Toxic in contact with skin	> 1000 ≤ 2000 mg/kg Harmful in contact with skin	> 2000 ≤ 5000 mg/kg May be harmful in contact with skin
Acute Inhalation Dust LC50 Gases LC50 Vapours LC50	≤ 0.05 mg/L ≤ 100 ppm/V ≤ 0.5 mg/L Fatal if inhaled	> 0.05 ≤ 0.5 mg/L > 100 ≤ 500 ppm/V > 0.5 ≤ 2.0 mg/L Fatal if inhaled	> 0.5 ≤ 1.0 mg/L > 500 ≤ 2500 ppm/V > 2.0 ≤ 10 mg/L Toxic if inhaled	> 1.0 ≤ 5 mg/L > 2500 ≤ 20000 ppm/V > 10 ≤ 20 mg/L Harmful if inhaled	See footnote below this table
Flammable liquids	Flash point < 23 degrees C and initial boiling point ≤ 35 degrees C. Extremely flammable liquid and vapour	Flash point < 23 degrees C and initial boiling point > 35 degrees C. Highly flammable liquid and vapour	Flash point ≥ 23 degrees C ≤ 60 degrees C. Flammable liquid and vapour	Flash point ≥ 60 degrees C ≤ 93 degrees C. Combustible liquid	Not Applicable

Note: Gases concentration are expressed in parts per million per volume (ppmV).

NOTE 1: Category 5 is for mixtures which are of relatively low acute toxicity but which under certain circumstances may pose a hazard to vulnerable populations. These mixtures are anticipated to have an oral or dermal LD50 value in the range of 2000-5000 mg/kg bodyweight or equivalent dose for other routes of exposure. In light of animal welfare considerations, testing in animals in Category 5 ranges is discouraged and should only be considered when there is a strong likelihood that results of such testing would have a direct relevance for protecting human health.

NOTE 2: These values are designed to be used in the calculation of the ATE for classification of a mixture based on its ingredients and do not represent test results. The values are conservatively set at the lower end of the range of Categories 1 and 2, and at a point approximately 1/10th from the lower end of the range for Categories 3 – 5.

### GHS Category table for reference: Continued

Study/hazard statement	Category 1	Category 2	Category 3
Eye Irritation	Effects on the cornea, iris or conjunctiva that are not expected to reverse or that have not fully reversed within 21 days. Causes severe eye damage.	2A: Effects on the cornea, iris or conjunctiva that fully reverse within 21 days. Causes severe eye irritation. 2B : Effects on the cornea, iris or conjunctiva that fully reverse within 7 days. Causes eye irritation.	Not applicable
Skin Irritation	Destruction of skin tissue, with sub categorization based on exposure of up to 3 minutes (A), 1 hour (B), or 4 hours (C). Causes severe skin burns and eye damage.	Mean value of ≥ 2.3 > 4.0 for erythema / eschar or edema in at least 2 of 3 tested animals from gradings at 24, 48, and 72 hours (or on 3 consecutive days after onset if reactions are delayed); inflammation that persists to end of the (normally 14-day) observation period. Causes skin irritation.	Mean value of ≥ 1.5 < 2.3 for erythema / eschar or edema in at least 2 of 3 tested animals from gradings at 24, 48, and 72 hours (or on 3 consecutive days after onset if reactions are delayed). Causes mild skin irritation.
Environment: Acute Toxicity Category	96 hr LC50 (fish) ≤ 1 mg/L 48 hr EC50 (crustacea) ≤ 1 mg/L, 72/96 hr ErC50 (aquatic plants) ≤ 1 mg/L Very toxic to aquatic life	96 hr LC50 (fish) > 1 ≤ 10 mg/L 48 hr EC50 (crustacea) > 1 ≤ 10 mg/L 72/96 hr ErC50 (aquatic plants) > 1 ≤ 10 mg/L Toxic to aquatic life	96 hr LC50 (fish) > 10 ≤ 100 mg/L 48 hr EC50 (crustacea) > 10 ≤ 100 mg/L 72/96 hr ErC50 (aquatic plants) > 10 ≤ 100 mg/L Harmful to aquatic life
Flammable Aerosol	Extremely flammable aerosol	Flammable aerosol	Not Applicable
Flammable solids	Using the burning rate test, substances or mixtures other than metal powders: (a) wetted zone does not stop fire and (b) burning time < 45 seconds or burning rate > 2.2 mm/second Using the burning rate test, metal powders that have burning time ≤ 5 minutes Flammable solid	Using the burning rate test, substances or mixtures other than metal powders: (a) wetted zone does not stop fire for at least 4 minutes and (b) burning time < 45 seconds or burning rate > 2.2 mm/second Using the burning rate test, metal powders that have burning time > 5 ≤ 10 minutes Flammable solid	Not Applicable
Flammable gases	Gases, which at 20 degrees C and a standard pressure of 101.3 kPa: (a) are ignitable when in a mixture of 13% or less by volume in air; or (b) have a flammable range with air of at least 12 percentage points regardless of the lower flammable limit. Extremely flammable gas	Gases, other than those of category 1, which, at 20 degrees C and a standard pressure of 101.3 kPa, have a flammable range while mixed in air. Flammable gas	Not Applicable

**Material Safety Data Sheet**

Issue Date: Aug. 01, 2013

Supersedes: Sep. 01, 2011

## ETHYLENE OXIDE

**GHS Label:** GHS02: Flame, GHS04: Pressure Gas, GHS06: Acute Toxicity, GHS08: Carcinogen



**Signal word: Danger**

**Details of statements:**

Hazard Statements	H220 Extremely flammable gas. H350 May cause cancer H340 May cause genetic defects H331 Toxic if inhaled. H319 Causes serious eye irritation. H335 May cause respiratory irritation H315 Causes skin irritation.
Precautionary Statement Prevention	P103: Read label before use. P210: Keep away from heat/sparks/open flames/hot surfaces. No smoking. P102: Keep out of reach of children. P201 Obtain special instructions before use. P202 Do not handle until all safety precautions have been read and understood P281 Use personal protective equipment as required. P261: Avoid breathing dust/fume/gas/mist/vapours/spray. P271 Use only outdoors or in a well-ventilated area. P264 Wash ... <i>exposed parts of the body to be washed thoroughly after handling.</i> P280: Wear protective gloves/protective clothing/eye protection/face protection
Precautionary Statement Response	P377 Leaking gas fire: Do not extinguish, unless leak can be stopped safely. P381 Eliminate all ignition sources if safe to do so. P308 IF exposed or concerned: P313 Get medical advice/attention. P101: If medical advice is needed, have product container or label at hand. P304 IF INHALED: P340 Remove to fresh air and keep at rest in a position comfortable for breathing P311 Call a POISON CENTER or doctor/physician P321: Specific treatment (see ... <i>&lt;reference to supplemental first aid instruction&gt;</i> on this label).* P305 IF IN EYES: P351 Rinse cautiously with water for several minutes P338 Remove contact lenses, if present and easy to do. Continue rinsing P337 If eye irritation persists: P313 Get medical advice/attention P312 Call a POISON CENTER or doctor/physician if you feel unwell. P302 IF ON SKIN: P352 Wash with plenty of soap and water. P332 If skin irritation occurs:

**Material Safety Data Sheet**

Issue Date: Aug. 01, 2013

**ETHYLENE OXIDE**

Supersedes: Sep. 01, 2011

	P313 Get medical advice/attention P362 Take off contaminated clothing and wash before re-use.
Precautionary Statement Storage	P403: Store in a well-ventilated place. P405 Store locked up. P233: Keep container tightly closed.
Precautionary Statement Disposal	Follow local regulation.

**Hazard ratings:**

NFPA HAZARD CODES	RATINGS SYSTEM
	<b>0 = No Hazard</b>
<b>FLAMMABILITY: 4</b>	<b>1 = Slight Hazard</b>
<b>INSTABILITY: 3</b>	<b>2 = Moderate Hazard</b>
	<b>3 = Serious Hazard</b>
	<b>4 = Severe Hazard</b>

Data Reference: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

**2.2 Information pertaining to particular dangers for human:**

Toxic substance with carcinogenic and mutagenic effects. Acute intoxication leads to central nervous system attenuation and narcotic effects occur. After swallowing possibility of aspiration (passage into the lung) and danger of chemical pneumonia (pulmonary oedema). Product irritates eyes and skin. High vapour concentrations irritate respiratory system and eyes and may lead to fast coma and death. Liquid is absorbed through skin and may develop allergic eruption. Chronic effects cause bone marrow damage, haemopoiesis disorder and may develop leukaemia.

**2.3 Information pertaining to particular dangers for the environment:**

Possible adverse effects on aquatic organisms.

**2.4 Other adverse effects:**

Extremely flammable and easily ignitable substance. Danger of ignition at normal temperature. Readily evaporates and vapours form with air toxic and explosive mixtures heavier than air. Mixtures keep above ground and after ignition they spread fast into far distances. Ignition possible when exposed to hot surfaces, sparks, naked flames and by electrostatic discharges too. The substance is practically insoluble in water, floats on the water level and forms toxic and explosive mixtures above the water level. Risk of explosion if emptied into drains or released into wastewater. Attacks rubber and plastics.

**Target Organs:** Brain and Spleen.

**Route of entry:**

Skin Contact	Skin Absorption	Eye Contact	Inhalation	Ingestion
Yes	Yes	Yes	Yes	Yes

**DATA REFERENCE:** <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

**Health hazards:**

Source	NTP listed?	IARC cancer review group?	OSHA Regulated?
Carcinogenicity	The chemical is known to be human carcinogen	The chemical is carcinogenic to humans	The chemical appears at 29 CFR part 1910 subpart Z

## Material Safety Data Sheet

Issue Date: Aug. 01, 2013

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## ETHYLENE OXIDE

DATA REFERENCE: Toxic release inventory (TRI) basis of Occupational Safety and Health Administration (OSHA) carcinogen, National Toxicological program (NTP), International Agency for Research on Cancer (IARC), <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

<b>Section 3 – COMPOSITION &amp; INFORMATION ON INGREDIENTS</b>
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Ingredients / Hazardous	CAS No.	EINECS No.	Percentage
Ethylene Oxide/Yes	75-21-8	200-849-9	100 %

Data reference: <http://ecb.jrc.ec.europa.eu/esis/>

<b>Section 4 – FIRST AID MEASURES</b>
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**4.1 General advice****IMMEDIATE MEDICAL ATTENTION IS REQUIRED AFTER INHALATION OR AFTER SWALLOWING.**

In case of health troubles or doubts, seek medical advice immediately and show this Material Safety Data Sheet.

Ensure activity of vitally important functions until the arrival of the doctor (artificial respiration, inhalation of oxygen, heart massage). If patient is unconscious, or in case of danger of blackout, transport patient in a stabilised position. In case of first degree burns (painful redness), and second degree burns (painful blisters), cool the affected area with cold running water for a long time. In case of third degree burns (redness, cracking pale skin, usually without pain), do not cool affected skin, dress the area with sterile dry gauze only.

**4.2 Inhalation**

Remove patient to fresh air, keep him warm and in order to rest quietly. Avoid walking. Seek medical advice.

SYMPTOMS AND EFFECTS: irritation, headache, dizziness, weakness, stupefaction, irritant coughing, convulsions, unconsciousness, possible respiratory inhibition or arrest.

**4.3 Skin contact**

Immediately take off all contaminated clothing and footwear. Flush effected area with copious quantities of water. Seek medical advice.

SYMPTOMS AND EFFECTS: mild irritation, degreasing, absorption, eruption and blistering.

**4.4 Eye contact**

Immediately flush eyes with clean lukewarm water and continue flushing for at least 15 minutes – keep the eyelids widely apart and flush thoroughly with mild water stream from the inner to the outer canthus. Seek medical advice.

SYMPTOMS AND EFFECTS: severe irritation, cornea damage.

**4.5 Swallowing**

Never give anything by mouth to an unconscious person, just put patient into a stabilized position. Seek medical advice immediately.

SYMPTOMS AND EFFECTS: nausea, vomiting, convulsions, irregular heartbeat.

<b>Section 5 – FIRE FIGHTING MEASURES</b>
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**5.1 Suitable extinguishing media:** Use water spray or fog nozzle to keep container cool. Move container away from fire if there is no risk.

**5.2 Extinguishing media to be avoided**

Not applicable

**5.3 Caution about specific danger in case of fire and fire-fighting procedures**

Danger of violent reaction or explosion. Vapours may travel considerable far distances and cause subsequent ignition. Vapours are heavier than air, may cumulate along the ground and in enclosed spaces – danger of explosion. Do not empty into drains. When burning, it emits carbon monoxide, carbon dioxide and irritant fumes. Containers with the substance exposed to excessive heat may explode. May polymerize exothermically if heated or contaminated. If the polymerization takes place inside a container, the container may rupture violently. Vapors may burn inside a container. Under prolonged exposure to fire or heat the containers may rupture violently and rocket.

**5.4 Special protective equipment for fire-fighters**

Wear full protective fire-resistant clothing and self-contained breathing apparatus. Vapors may react violently with caustic soda, hydrated lime (quicklime), magnesium chloride, ammonia, alcohols and amines. Most materials other than stainless steel or nickel will cause polymerization or decomposition. Decomposition may cause exothermic rearrangement.

**Section 6 –ACCIDENTAL RELEASE MEASURES****6.1 Person-related safety precautions**

Isolate hazard area. Evacuate all unauthorized personnel not participating in rescue operations from the area. Avoid entry into danger area. Remove all possible sources of ignition. Stop traffic and switch off the motors of the engines. Do not smoke and do not handle with naked flame. Use explosion-proof lamps and non-sparking tools. Avoid contact with the substance. Apply recommended full protective personal equipment. When escaping from the contaminated area, wear mask with cartridge against organic vapours. In case of general average, evacuate personnel from danger area. In places under the ground level and in enclosed spaces (including drains) risk of explosion and accumulation of toxic vapours.

**6.2 Precautions for protection of the environment**

Prevent from further leaks of substance. Do not allow substance to enter soil, water and sewage systems. In case of substance discharge to water courses or water containers, inform water consumers immediately, stop service and exploitation of water.

**6.3 Recommended methods for cleaning and disposal**

Pump off substance safely, soak up residues with compatible porous material and forward for disposal in closed containers. Dispose off under valid legal waste regulations.

**Section 7 –HANDLING AND STORAGE****7.1 Information for safe handling**

Observe all fire-fighting measures (no smoking, do not handle with naked flame and remove all possible sources of ignition). Take precautionary measures against static discharges. Wear recommended personal protective equipment and observe instructions to prevent possible contact of substance with skin and eyes and

inhalation. Avoid leak to environment. Vapors are heavier than air.

**7.2 Information for storage**

Storerooms should meet the requirements for the fire safety of constructions and electrical facilities and should be in conformity with valid regulations. Store in cool, well-ventilated place with effective exhaust, away from heat and all sources of ignition. Store in tightly closed container. Do not store together with oxidizing agents. Take precautionary measures against static discharges. Avoid leak to environment. May polymerize exothermically if heated or contaminated. If the polymerization takes place inside a container, the container may rupture violently. Vapors may burn inside a container.

**7.3 Information for specific use**

Not applicable.

**Section 8 – EXPOSURE CONTROL & PERSONAL PROTECTION**

**8.1 Occupational Exposure Limits:**

Material	Source	Type	ppm	mg/m3	Notation
ETHYLENE OXIDE	ACGIH	TWA	1		
	ACGIH	STEL	5		
	ACGIH	SKIN_DES TWA	NA		
	NIOSH	IDLH	NA		
	OSHA	TWA	1		
	OSHA	STEL	5		

NA: Data not available

DATA REFERENCE: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

Provide adequate ventilation when using the material and follow the principles of good occupational hygiene to control personal exposure.

Recommended determination method in the work place atmosphere: gas chromatography, detector tube.

**8.2 Occupational exposure controls**

Collective protection measures: General and local ventilation, effective exhaust.

Individual protection measures: Personal protective equipment (PPE) for the protection of eyes, hands and skin corresponding with the performed labour has to be kept at disposition for the employees. In cases, where the workplace exposure control limits cannot be observed with the help of technical equipment or where it is not possible to ensure that the respiratory system exposure does not represent a health hazard for the personnel, adequate respiratory protection have to be kept at disposition. In the case of continuous use of this equipment during constant work, safety breaks have to be scheduled, if the PPE-character requires this. All PPE have to be kept in disposable state and the damaged or contaminated equipment has to be replaced immediately.

**RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE):**

HANDS		EYES	BODY		RESPIRATORY	
						

**Respiratory protection:** If the exposure limit is exceeded and engineering controls are not feasible, wear a supplied air, full-face piece respirator, airline hood, or full face piece self-contained breathing apparatus. protective mask with canister A (brown coloured, protecting against organic vapours), self-contained breathing

apparatus.

**Eye protection:** Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

**Hand protection:** Wear gloves of impervious material.

**Body protection:** Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact. Protective coverall antistatic design recommended, impervious when handling big amounts (nitrile rubber), sealed leather footwear (free from synthetic adhesives)

**Hygiene Measures:** Wash hands, forearms and face thoroughly after handling. 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.

### 8.3 Environmental exposure controls

Proceed in accordance with valid air and water legislative regulations.

**Engineering measures:** Use only with adequate ventilation. If user operations generate dust, fumes, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

<b>Section 9 –PHYSICAL AND CHEMICAL PROPERTIES</b>
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Appearance	Liquid, colourless or light yellow
Odour	Characteristic
Solubility in water	Completely soluble in water above 11.4 °C
Relative Density (H <sub>2</sub> O=1) @ 0°C	0.882
Boiling Point °C	10.7 °C
Melting Point °C	-111 °C
Relative Vapour Density (Air=1)	1.5
Flash point °C	0°C Open cup
Auto ignition °C	440 °C
Vapour pressure (mmHg) @ 25 °C	1.4
Molecular weight	44.06
Explosive limits in air % by volume	LEL 3% UEL 100%
PH	NA
Viscosity mPa.s @10 °C	0.254
Pour point	NA
Evaporation rate (ether=1)	NA
Octanol/water partition coefficient log Kow	-0.30
% volatile	NA

NA: NOT AVAILABLE

DATA REFERENCE <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>



<b>Section 10 –CHEMICAL STABILITY AND REACTIVITY INFORMATION</b>
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**10.1 Conditions to avoid**

Concentrations within the explosion limits, sources of ignition, high temperature, sun radiation.

**10.2 Material to avoid****AIR AND WATER REACTIONS:**

Highly flammable. Flammable over a wide vapor-air concentration range. Must be diluted on the order of 24 to 1 with water to lose flammability. Soluble in water. Highly flammable, severe explosion hazard when exposed to flame. The autoignition temperature may be as low as 140° C in presence of rust. Rapid compression of the vapor with air causes explosion. Ethylene oxide vapor may be initiated into explosive decomposition in absence of air [Hess, L. G., et al., Ind. Eng. Chem., 1950, 42, p. 1251]. Metal fittings containing magnesium, copper or silver should be avoided, since traces of acetylene in ethylene oxide may produce metal acetylides capable of detonating the vapor [MCA SD-38, 1971]. Violent polymerization occurs on contact with strong bases (alkali hydroxides, ammonia) or acids, amines, metallic potassium, oxides (aluminum oxide, iron oxide, rust), covalent halides (aluminum chloride, ferric chloride, tin(IV) chloride) [Gupta, A. K., J. Soc. Chem. Ind., 1949, 68, p. 179]. Violent reaction with m-nitroaniline, magnesium perchlorate, mercaptans, thiols, triethylamine [Bretherick, 5th ed., 1995, p. 316]. Ethylene oxide and SO<sub>2</sub> can react violently in pyridine solution with pressurization if ethylene oxide is in excess (Nolan, 1983, Case History 51).

**REACTIVE GROUPS:** Epoxides

**10.3 Hazardous decomposition products:** Pure EO decomposes explosively if detonated, ignited or heated to about 560 °C, even in absence of air.

**Polymerization:** Very susceptible to polymerization initiated at ambient temperature by acids, bases or catalysts such as anhydrous Chlorides or Iron, Aluminium, Tin, and metal oxides. Iron rust must be removed from any equipment containing Ethylene oxide. The polymerization is exothermic. Thermal initiation starts at around 100 C and once started will be promoted by Iron. If the temperature is not controlled the polymerization will self accelerate causing vapourization of unreacted ethylene oxide and possibly explosive decomposition of the vapour. Slow polymerization can also occur, producing solid polymer, which is thermally stable.

<b>Section 11 –TOXICOLOGICAL INFORMATION</b>
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**11.1 Acute effects**

Toxic substance with carcinogenic and mutagenic effects. Acute intoxication leads to central nervous system attenuation and narcotic effects occur. After swallowing possibility of aspiration (passage into the lung) and danger of chemical pneumonia (pulmonary oedema). Product irritates eyes and skin. High vapour concentrations irritate respiratory system and eyes and may lead to fast coma and death. Liquid is absorbed through skin and may develop allergic eruption. Acute toxicity data:

Parameter	Route	Species	Values	Exposure period
LD <sub>50</sub>	Oral	Rat	330 mg/Kg	Not applicable
LC <sub>50</sub>	Inhalation	Rat	1460 ppm	4 hours

Data Reference: <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>.

**11.2 Repeated dose toxicity**

Chronic effects cause bone marrow damage, haemopoiesis disorder and may develop leukaemia.

**11.3 Sensitisation**

May cause skin allergy.

**11.4 CMR effects (carcinogenicity, mutagenicity, toxicity for reproduction)**

Proved carcinogenic effects for humans. Substance has mutagenic effects.

**11.5 Toxicokinetics, metabolism, distribution: NA.**

**Section 12 – ECOLOGICAL INFORMATION**

**12.1 Ecotoxicity data:**

Parameter	Route	Species	Values	Exposure period
LC50	Inhalation	Gold fish	90 mg/L	24 hours

<http://toxnet.nlm.nih.gov/cgi-bin/sis/search>

**12.2 Mobility: NA**

**12.3 Persistence and degradability:** Ethylene oxide hydrolyzes to ethylene glycol. Biodegradation is expected in a wastewater treatment plant.

**12.4 Bioaccumulative potential: NA**

**12.5 Results of PBT assessment Persistence and Degradation:** Photo-degrade in air.

**12.6 Other adverse effects:** Environmental Fate: A high adsorptive in soil is expected.

**Section 13– DISPOSAL CONSIDERATION**

**Local Legislation:** Disposal should be in accordance with applicable regional, national, and local laws and regulations. This product should not be dumped, spilled, rinsed or washed into sewers or public waterways.

**13.1 Recommended disposal methods for the substance / preparation**

Product reuse or disposal in accordance with valid waste legislative regulations.

**13.2 Recommended disposal methods for contaminated packaging**

Product is transported in tank-vehicles.

**13.3 Waste management measures that control exposure of humans and environment**

Proceed in accordance with valid health, air and water legislative regulations.

**13.4 Waste regulation:** Follow local regulation.

**Section 14– TRANSPORT INFORMATION**

**International Transport Regulation:**

**ADR/RID (Road/Rail), IMDG (Sea) and ICAO/IATA (Air)**

**14.1**

**Proper Shipping Name:** Ethylene Oxide

**Hazard Class:** 2.3, Flammable Liquid

**UN Number:** 1040

Material Safety Data Sheet

Issue Date: Aug. 01, 2013

Supersedes: Sep. 01, 2011

## ETHYLENE OXIDE

**Packing Group:** II  
**Emergency Action Code:** 2PE  
**14.2 Special transport precautionary measures:** Not applicable.

### Section 15– REGULATORY INFORMATION

**MSDS format on a 16 Section based on guidance provided in:**

**Indian Regulation:**

Manufacture, Storage and Import of Hazardous Chemicals Rule, 1989.  
 The Factories Act 1948

**International Regulations:**

European SDS Directive  
 ANSI MSDS Standard  
 ISO 11014-1 1994  
 WHMIS Requirements

**United States**

Hazard Communication Standard

**Canada**

Hazardous Products Act and Controlled Products Regulations

**Europe**

Dangerous Substance and Preparations Directives

**Australia**

National Model Regulations for the Control of Workplace Hazardous Substances

**The Globally Harmonized System of Classification and Labeling of Chemicals endorsed by The UN Economic and Social Council**

\*RISK PHRASES: R 12 Extremely Flammable, R 23 Toxic by inhalation, R 45 May cause cancer, R 46 may cause heritable genetic damage, R 36/37/38 Irritating to eyes ,respiratory system & skin

\*SAFETY PHRASES: S45 In case of accident or if you feel unwell, seek medical advice immediately, S53 Avoid exposure – obtain special instruction before use. May cause cancer, flammable, Toxic: danger of serious damage to health by prolonged exposure

\*These standard risk and safety phrases for use when interpreting Material Safety data Sheets are derived from the European Union Regulation, CHIP Regulations - Chemicals (Hazard Information and Packaging for Supply). They are required to be used in Materials Safety Data Sheets to identify potential hazards and offer safe handling advice.

### Section 16 – OTHER INFORMATION

Training instructions

Personnel handling the product has to be acquainted demonstrably with its hazardous properties, with health and environmental protection principles related to the product and first aid principles.

Tremcard details/Reference: Refer Section 14

**Material Safety Data Sheet**

**Issue Date: Aug. 01, 2013**

**Supersedes: Sep. 01, 2011**

**ETHYLENE OXIDE**

Local bodies involved (Applicable only with in India): Local District Authority and Local Crisis Group

Sources of data used to compile the Material Safety Data Sheet

**Data compilation reference:** National Institute for Occupational Safety and Health guide to chemical hazards and International Chemical Safety Cards (WHO/IPCS/ILO) and <http://toxnet.nlm.nih.gov/cgi-bin/sis/search>, <http://webnet3.oecd.org/eChemPortal/Results2.aspx?SubstanceId=169630>, <http://ecb.jrc.ec.europa.eu/esis/index.php?PGM=ein>, <http://www.cdc.gov/niosh/npg/npgd0049.html>

MSDS Revision Status:

Date of Revision	Revised Sections	Supersedes
Sep. 01, 2009	Format revised	Feb. 01, 2008
Sep. 01, 2011	Section 4 (4.3)	Sep. 01, 2009
Aug. 01, 2013	Section 2 NFPA Hazard statement	Sep. 01, 2011

**This MSDS is issued by the Helious Specialty Gases Pvt.Ltd.**

**Contact Details: For any enquiry/comment regarding this Material Safety Data Sheet, kindly contact at [sales@heliousgases.com](mailto:sales@heliousgases.com)**

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End of MSDS