

SAFETY DATA SHEET

In accordance with Occupational Safety and Health Act's Standard of Classification and Labelling of Chemical Substances and MSDS

PROPYLENE OXIDE

Version 6.7

Revision Date 2022.12.20

MSDS number 1104
Print Date 2022.12.21

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : PROPYLENE OXIDE

Product code : U1112

CAS-No. : 75-56-9

Other means of identification : Epoxy propane, 1,2-, Methyl ethylene oxide, Methyl oxirane, PO, Propylene epoxide, Propylene oxide, 1,2-

Recommended use of the chemical and restrictions on use

Recommended use : Chemical intermediate.

Restrictions on use : Restricted to professional users., This product must not be used in applications other than the above without first seeking the advice of the supplier.

Manufacturer or supplier's details

Supplier : SHELL EASTERN CHEMICALS (S)
A REGISTERED BUSINESS OF SHELL EASTERN
TRADING (PTE) LTD (UEN:198902087C)
9 North Buona Vista Drive , #07-01
The Metropolis Tower 1
Singapore 138588
Singapore

Telephone : + 82 2 360 1169

Telefax : +82 2 393 6196

Contact for Safety Data Sheet : sccmsds@shell.com

Emergency telephone number : + (65) 6542 9595 (Alert-SGS)

Organization that prepared the SDS : JOIN International Ltd. (JIL)
Samsung Cheil Bldg., 18th Fl,
309, Tereran-ro, Gangnam-gu,
Seoul, 06151, Republic of Korea
+82 (0)2 527 4317
+82 (0)2 527 4314 (FAX)

2. HAZARDS IDENTIFICATION

GHS Classification

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Flammable liquids	: Category 1
Acute toxicity (Oral)	: Category 4
Acute toxicity (Dermal)	: Category 3
Acute toxicity (Inhalation)	: Category 3
Eye irritation	: Category 2A
Specific target organ toxicity - single exposure	: Category 3 (Respiratory Tract)
Germ cell mutagenicity	: Category 1B
Carcinogenicity	: Category 1B

GHS label elements

Hazard pictograms



Signal word

: Danger

Hazard statements

: PHYSICAL HAZARDS:
H224 Extremely flammable liquid and vapour.
HEALTH HAZARDS:
H302 Harmful if swallowed.
H311 Toxic in contact with skin.
H331 Toxic if inhaled.
H319 Causes serious eye irritation.
H335 May cause respiratory irritation.
H340 May cause genetic defects.
H350 May cause cancer.
ENVIRONMENTAL HAZARDS:
Not classified as an environmental hazard under GHS criteria.

Precautionary statements

Prevention:

P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood.
P210 Keep away from heat/ sparks/ open flames/ hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting equipment.
P242 Use only non-sparking tools.
P243 Take precautionary measures against static discharge.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P264 Wash hands thoroughly after handling.
P270 Do not eat, drink or smoke when using this product.
P271 Use only outdoors or in a well-ventilated area.
P280 Wear protective gloves/ protective clothing/ eye protection/ face protection.

Response:

P301 + P310 IF SWALLOWED: Immediately call a POISON

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<p>CENTER/ doctor. P302 + P352 IF ON SKIN: Wash with plenty of water and soap. P303 + P361 + P353 IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower. P304 + P340 IF INHALED: Remove person to fresh air and keep comfortable for breathing. P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. P308 + P313 IF exposed or concerned: Get medical advice/ attention. P330 Rinse mouth. P332 + P313 If skin irritation occurs: Get medical advice/ attention. P337 + P313 If eye irritation persists: Get medical advice/ attention. P362 + P364 Take off contaminated clothing and wash it before reuse. P370 + P378 In case of fire: Use appropriate media to extinguish.</p> <p>Storage: P403 + P233 Store in a well-ventilated place. Keep container tightly closed. P235 Keep cool. P405 Store locked up.</p> <p>Disposal: P501 Dispose of contents/ container to an approved waste disposal plant.</p>		

Other hazards which do not result in classification

Vapours are heavier than air. Vapours may travel across the ground and reach remote ignition sources causing a flashback fire danger. Vapours may ignite and explode. This material is a static accumulator. Even with proper grounding and bonding, this material can still accumulate an electrostatic charge. If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.

NFPA Rating (Health, Fire, : 3, 4, 2
Reactivity)

3. COMPOSITION/INFORMATION ON INGREDIENTS

Substance / Mixture : Substance

Components

Chemical name	Common Name	CAS-No.	Concentration (% w/w)
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propylene oxide	methyloxirane	75-56-9
		<= 100

4. FIRST-AID MEASURES

- General advice : DO NOT DELAY.
Keep victim calm. Obtain medical treatment immediately.
- In case of eye contact : Immediately flush eye(s) with plenty of water.
Remove contact lenses, if present and easy to do. Continue rinsing.
Transport to the nearest medical facility for additional treatment.
- In case of skin contact : Remove contaminated clothing. Immediately flush skin with large amounts of water for at least 15 minutes, and follow by washing with soap and water if available. If redness, swelling, pain and/or blisters occur, transport to the nearest medical facility for additional treatment.
- If inhaled : Call emergency number for your location / facility.
Remove to fresh air. Do not attempt to rescue the victim unless proper respiratory protection is worn. If the victim has difficulty breathing or tightness of the chest, is dizzy, vomiting, or unresponsive, give 100% oxygen with rescue breathing or Cardio-Pulmonary Resuscitation as required and transport to the nearest medical facility.
- If swallowed : If swallowed, do not induce vomiting: transport to nearest medical facility for additional treatment. If vomiting occurs spontaneously, keep head below hips to prevent aspiration. Rinse mouth.
- Most important symptoms and effects, both acute and delayed : Respiratory irritation signs and symptoms may include a temporary burning sensation of the nose and throat, coughing, and/or difficulty breathing.
Breathing of high vapour concentrations may cause central nervous system (CNS) depression resulting in dizziness, light-headedness, headache, nausea and loss of coordination. Continued inhalation may result in unconsciousness and death.
Skin irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blisters.
Eye irritation signs and symptoms may include a burning sensation, redness, swelling, and/or blurred vision.
Ingestion may result in nausea, vomiting and/or diarrhoea.
Peripheral nerve damage may be evidenced by impairment of motor function (incoordination, unsteady walk, or muscle weakness in the extremities, and/or loss of sensation in the arms and legs).

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| Protection of first-aiders | : When administering first aid, ensure that you are wearing the appropriate personal protective equipment according to the incident, injury and surroundings. |
| Notes to physician | : IMMEDIATE TREATMENT IS EXTREMELY IMPORTANT!
Artificial respiration may be required.
Call a doctor or poison control center for guidance.
Treat symptomatically. |

5. FIRE-FIGHTING MEASURES

Suitable and unsuitable extinguishing media

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|------------------------------|---|
| Suitable extinguishing media | : Large fires should only be fought by properly trained fire fighters.
Alcohol-resistant foam, water spray or fog. Dry chemical powder, carbon dioxide, sand or earth may be used for small fires only.
Do not discharge extinguishing waters into the aquatic environment. |
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| Unsuitable extinguishing media | : Do not use water in a jet. |
|--------------------------------|------------------------------|

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|--------------------------------------|---|
| Specific hazards during firefighting | : Flammable vapours may be present even at temperatures below the flash point.
Will float and can be reignited on surface water.
The vapour is heavier than air, spreads along the ground and distant ignition is possible.
Carbon monoxide may be evolved if incomplete combustion occurs.
Contents are under pressure and can explode when exposed to heat or flames. |
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| Specific extinguishing methods | : Standard procedure for chemical fires.
Clear fire area of all non-emergency personnel.
All storage areas should be provided with adequate fire fighting facilities.
Keep adjacent containers cool by spraying with water. |
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| Special protective equipment for firefighters | : Proper protective equipment including chemical resistant gloves are to be worn; chemical resistant suit is indicated if large contact with spilled product is expected. Self-Contained Breathing Apparatus must be worn when approaching a fire in a confined space. Select fire fighter's clothing approved to relevant Standards (e.g. Europe: EN469). |
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Personal precautions, protective equipment and emergency procedures	<ul style="list-style-type: none"> : Observe all relevant local and international regulations. Risk of explosion. Inform the emergency services if liquid enters surface water drains. Notify authorities if any exposure to the general public or the environment occurs or is likely to occur. Local authorities should be advised if significant spillages cannot be contained. : Avoid contact with spilled or released material. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. Isolate hazard area and deny entry to unnecessary or unprotected personnel. Stay upwind and keep out of low areas. Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks. Note - Since the danger of fire is so great, bunker gear worn over protective clothing is highly recommended.
Environmental precautions	<ul style="list-style-type: none"> : Shut off leaks, if possible without personal risks. Remove all possible sources of ignition in the surrounding area. Use appropriate containment to avoid environmental contamination. Prevent from spreading or entering drains, ditches or rivers by using sand, earth, or other appropriate barriers. Attempt to disperse the vapour or to direct its flow to a safe location, for example by using fog sprays.
Methods and materials for containment and cleaning up	<ul style="list-style-type: none"> : Large spillage: Prevent from spreading by making a barrier with sand, earth or other containment material. Remove with explosion-proof vacuum trucks or pump to storage/salvage vessels. Test atmosphere for vapours to ensure safe working conditions before other personnel are allowed into area. Treat residues as for small spillage. Small spillage: Soak up residue with an absorbent such as clay, sand or other suitable material and dispose of properly. Allow to evaporate. Retain washings as contaminated waste. Note that aqueous solutions have a low flash point unless very dilute.
Observe all relevant local and international regulations.	
Additional advice	<ul style="list-style-type: none"> : For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet. For guidance on disposal of spilled material see Section 13 of this Safety Data Sheet.

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7. HANDLING AND STORAGE

- General Precautions : Avoid breathing of or direct contact with material. Only use in well ventilated areas. Wash thoroughly after handling. For guidance on selection of personal protective equipment see Section 8 of this Safety Data Sheet.
Use the information in this data sheet as input to a risk assessment of local circumstances to help determine appropriate controls for safe handling, storage and disposal of this material.
Ensure that all local regulations regarding handling and storage facilities are followed.
- Advice on safe handling : Ambient.
Avoid exposure. Obtain special instructions before use.
Bulk storage tanks should be diked (bunded).
Do NOT use compressed air for filling, discharging, or handling operations.
Even with proper grounding and bonding, this material can still accumulate an electrostatic charge.
Extinguish any naked flames. Do not smoke. Remove ignition sources. Avoid sparks.
Handling Temperature:
If sufficient charge is allowed to accumulate, electrostatic discharge and ignition of flammable air-vapour mixtures can occur.
Keep away from heat/sparks/open flames/hot surfaces.
Monitor concentrations in air at regular intervals.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Use only outdoors or in a well-ventilated area.
Properly dispose of any contaminated rags or cleaning materials in order to prevent fires.
Restrict line velocity during pumping in order to avoid generation of electrostatic discharge (≤ 1 m/s until fill pipe submerged to twice its diameter, then ≤ 7 m/s). Avoid splash filling.
Store in a well-ventilated place and keep it at a low temperature (provided that the storage container is at a temperature not exceeding ignition point (or flash point)).
These activities may lead to static discharge e.g. spark formation.
These include but are not limited to pumping (especially turbulent flow), mixing, filtering, splash filling, cleaning and filling of tanks and containers, sampling, switch loading, gauging, vacuum truck operations, and mechanical movements.
This product is intended for use in closed systems only.
Use local exhaust ventilation if there is risk of inhalation of vapours, mists or aerosols.
Avoid breathing dust/fume/gas/mist/vapors.
Avoid contact with eyes, skin, and clothing (except for

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protective clothing) at all times.

Avoidance of contact : Clay-based absorbents.
Bases, ammonia, primary and secondary amines, water and acids.
Heavy metals, alkali metals, alkali metal hydroxides, anhydrous chlorides of aluminium. iron, tin, copper and its alloys.
Strong oxidising agents.

Product Transfer : If positive displacement pumps are used, these must be fitted with a non-integral pressure relief valve. Lines should be purged with nitrogen before and after product transfer. Refer to supplier for further product transfer instructions if required. Refer to guidance under Handling section.

Safe storage methods (including conditions to be avoided)

Conditions for safe storage : Refer to section 15 for any additional specific legislation covering the packaging and storage of this product.

Other data : Keep away from aerosols, flammables, oxidizing agents, corrosives and from other flammable products which are not harmful or toxic to man or to the environment.
A reliable fixed sprinkler/deluge system should be installed.
Tanks must be clean, dry and rust-free.
Prevent ingress of water.
Must be stored in a diked (bunded) well- ventilated area, away from sunlight, ignition sources and other sources of heat.
Tanks should be fitted with a vapour recovery system.
Vapours from tanks should not be released to atmosphere.
Breathing losses during storage should be controlled by a suitable vapour treatment system.
Tanks must be specifically designed for use with this product.
Cleaning, inspection and maintenance of storage tanks is a specialist operation, which requires the implementation of strict procedures and precautions.
These include issuing of work permits, gas-freeing of tanks, using a manned harness and lifelines and wearing air-supplied breathing apparatus.

Storage Temperature:

30 °C / 86 °F maximum.

Use lowest practicable storage temperatures and avoid through-draughts of air to minimise risk of generating a flammable condition in the tank space.

Electrostatic charges will be generated during pumping.

Electrostatic discharge may cause fire. Ensure electrical continuity by bonding and grounding (earthing) all equipment to reduce the risk.

The vapours in the head space of the storage vessel may lie in the flammable/explosive range and hence may be flammable.

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Packaging material : Suitable material: Stainless steel., Mild steel.
Unsuitable material: Plastics, Aluminum

Specific use(s) : Not applicable

Ensure that all local regulations regarding handling and storage facilities are followed.
See additional references that provide safe handling practices: American Petroleum Institute 2003 (Protection Against Ignitions Arising out of Static, Lightning and Stray Currents) or National Fire Protection Agency 77 (Recommended Practices on Static Electricity).
IEC/TS 60079-32-1: Electrostatic hazards, guidance

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Components with workplace control parameters

Components	CAS-No.	Value type (Form of exposure)	Control parameters / Permissible concentration	Basis
propylene oxide	75-56-9	TWA	2 ppm	KR OEL
	Further information: Sufficient evidence of carcinogenicity in test animals or limited evidence of carcinogenicity in both animal and human testing., Substances which should be regarded as if they induce heritable mutations in the germ cells of humans			
propylene oxide	75-56-9	TWA	2 ppm	ACGIH
propylene oxide		TWA	100 ppm 240 mg/m3	OSHA Z-1

Biological occupational exposure limits

No biological limit allocated.

Monitoring Methods

Monitoring of the concentration of substances in the breathing zone of workers or in the general workplace may be required to confirm compliance with an OEL and adequacy of exposure controls. For some substances biological monitoring may also be appropriate.

Validated exposure measurement methods should be applied by a competent person and samples analysed by an accredited laboratory.

Examples of sources of recommended exposure measurement methods are given below or contact the supplier. Further national methods may be available.

National Institute of Occupational Safety and Health (NIOSH), USA: Manual of Analytical Methods
<http://www.cdc.gov/niosh/>

Occupational Safety and Health Administration (OSHA), USA: Sampling and Analytical Methods
<http://www.osha.gov/>

Health and Safety Executive (HSE), UK: Methods for the Determination of Hazardous Substances
<http://www.hse.gov.uk/>

Institut für Arbeitsschutz Deutschen Gesetzlichen Unfallversicherung (IFA), Germany
<http://www.dguv.de/inhalt/index.jsp>

L'Institut National de Recherche et de Sécurité, (INRS), France <http://www.inrs.fr/accueil>

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Engineering measures : The level of protection and types of controls necessary will vary depending upon potential exposure conditions. Select controls based on a risk assessment of local circumstances. Appropriate measures include:
Adequate explosion-proof ventilation to control airborne concentrations.
Local exhaust ventilation is recommended.
Firewater monitors and deluge systems are recommended.
Items that cannot be decontaminated should be destroyed (see Chapter 13).
Eye washes and showers for emergency use.

General Information:

Consider technical advances and process upgrades (including automation) for the elimination of releases. Minimise exposure using measures such as closed systems, dedicated facilities and suitable general/local exhaust ventilation. Drain down systems and clear transfer lines prior to breaking containment. Clean/flush equipment, where possible, prior to maintenance. Where there is potential for exposure: restrict access to authorised persons; provide specific activity training to operators to minimise exposures; wear suitable gloves and coveralls to prevent skin contamination; wear respiratory protection when there is potential for inhalation; clear up spills immediately and dispose of wastes safely. Ensure safe systems of work or equivalent arrangements are in place to manage risks. Regularly inspect, test and maintain all control measures. Consider the need for risk based health surveillance.

Personal protective equipment

Protective measures

Personal protective equipment (PPE) should meet recommended national standards. Check with PPE suppliers.

Respiratory protection : If engineering controls do not maintain airborne concentrations to a level which is adequate to protect worker health, select respiratory protection equipment suitable for the specific conditions of use and meeting relevant legislation. Check with respiratory protective equipment suppliers. Where air-filtering respirators are unsuitable (e.g. airborne concentrations are high, risk of oxygen deficiency, confined space) use appropriate positive pressure breathing apparatus. Where air-filtering respirators are suitable, select an appropriate combination of mask and filter.
If air-filtering respirators are suitable for conditions of use:

Select a filter suitable for organic gases and vapours [boiling point <65 °C (149 °F)]

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| Eye protection | : Wear goggles for use against liquids and gas, combined with face shield. |
| Hand protection | |
| Remarks | : Where hand contact with the product may occur the use of gloves approved to relevant standards (e.g. Europe: EN374, US: F739) made from the following materials may provide suitable chemical protection. Longer term protection: Butyl rubber. Incidental contact/Splash protection: Nitrile rubber gloves. Silver Shield. For continuous contact we recommend gloves with breakthrough time of more than 240 minutes with preference for > 480 minutes where suitable gloves can be identified. For short-term/splash protection we recommend the same but recognize that suitable gloves offering this level of protection may not be available and in this case a lower breakthrough time maybe acceptable so long as appropriate maintenance and replacement regimes are followed. Glove thickness is not a good predictor of glove resistance to a chemical as it is dependent on the exact composition of the glove material. Glove thickness should be typically greater than 0.35 mm depending on the glove make and model. Suitability and durability of a glove is dependent on usage, e.g. frequency and duration of contact, chemical resistance of glove material, dexterity. Always seek advice from glove suppliers. Contaminated gloves should be replaced. Personal hygiene is a key element of effective hand care. Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturizer is recommended. |
| Skin and body protection | : Wear antistatic and flame-retardant clothing. Wear chemical resistant gloves/gauntlets and boots. Where risk of splashing, also wear an apron. |
| Thermal hazards | : When handling cold material that can cause frost burns, wear cryogenic gloves, safety hat and visor, cold resistant overalls (with cuffs over gloves and legs over boots) and heavy duty boots e.g. leather for cold resistance. |
| Hygiene measures | : Wash hands before eating, drinking, smoking and using the toilet.
Launder contaminated clothing before re-use. |

Environmental exposure controls

- | | |
|----------------|--|
| General advice | : Local guidelines on emission limits for volatile substances must be observed for the discharge of exhaust air containing vapour.
Minimise release to the environment. An environmental assessment must be made to ensure compliance with local environmental legislation.
Information on accidental release measures are to be found in section 6. |
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9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Oily liquid.
Colour	: Colourless to yellowish
Odour	: Ethereal
Odour Threshold	: 35 ppm
pH	: Data not available
Melting / freezing point	: -112 °C / -170 °F
Boiling point/boiling range	: 35 °C / 95 °F
Flash point	: -37 °C / -35 °F Method: Tag Closed Cup (ASTM D56)
Evaporation rate	: ca. 12 Method: ASTM D 3539, nBuAc=1
Flammability (solid, gas)	: Not applicable
Upper/Lower explosion limit	
Upper explosion limit	: 37.0 %(V)
Lower explosion limit	: 1.7 %(V)
Vapour pressure	: 25.1 kPa (0 °C / 32 °F) 59.8 kPa (20 °C / 68 °F) 202.6 kPa (55 °C / 131 °F)
Solubility(ies)	
Water solubility	: 405 kg/m ³ (20 °C / 68 °F)
Relative vapour density	: 2.0 (Air = 1.0)
Relative density	: 0.824 (3.89 °C / 39.00 °F) Method: ASTM D4052
Density	: 830 kg/m ³ (20 °C / 68 °F) Method: ASTM D4052
Partition coefficient: n-	: log Pow: 0.055

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octanol/water		
Auto-ignition temperature	:	490 °C / 914 °F
Decomposition temperature	:	Data not available
Viscosity		
Viscosity, dynamic	:	0.58 mPa.s (20 °C / 68 °F) Method: ASTM D445
Viscosity, kinematic	:	0.374 mm2/s (20 °C / 68 °F) Method: ASTM D445
		0.447 mm2/s (0 °C / 32 °F) Method: ASTM D445
Explosive properties	:	Not classified
Oxidizing properties	:	Data not available
Surface tension	:	71.5 mN/m, 15 °C / 59 °F
Conductivity	:	Low conductivity: < 100 pS/m The conductivity of this material makes it a static accumulator., A liquid is typically considered nonconductive if its conductivity is below 100 pS/m and is considered semi-conductive if its conductivity is below 10,000 pS/m., Whether a liquid is nonconductive or semi-conductive, the precautions are the same., A number of factors, for example liquid temperature, presence of contaminants, and anti-static additives can greatly influence the conductivity of a liquid
Particle size	:	Data not available
Molecular weight	:	58.01 g/mol

10. STABILITY AND REACTIVITY

Chemical stability and possibility of hazardous reactions:

- : Material will polymerise at elevated temperatures 122 °F (50 °C) or if contaminated with water.
- No hazardous reaction is expected when handled and stored according to provisions
- Reacts violently with strong oxidising agents.
- Reacts with strong acids.

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Conditions to avoid	: Heat, flames, and sparks. Prevent vapour accumulation. Temperatures above 30 °C / 86 °F.	
Incompatible materials	: Clay-based absorbents. Bases, ammonia, primary and secondary amines, water and acids. Heavy metals, alkali metals, alkali metal hydroxides, anhydrous chlorides of aluminium. iron, tin, copper and its alloys. Strong oxidising agents.	
Hazardous decomposition products	: Thermal decomposition is highly dependent on conditions. A complex mixture of airborne solids, liquids and gases including carbon monoxide, carbon dioxide, sulphur oxides and unidentified organic compounds will be evolved when this material undergoes combustion or thermal or oxidative degradation. Unknown toxic products may be formed.	

11. TOXICOLOGICAL INFORMATION

Basis for assessment : Information given is based on product testing.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Information on likely routes of exposure : Inhalation is the primary route of exposure.

Health hazard information

Acute toxicity

Components:

propylene oxide:

Acute oral toxicity : LD 50 Rat, male and female: > 300 - <= 2000 mg/kg
Method: Test(s) equivalent or similar to OECD Test Guideline 401
Remarks: Harmful if swallowed.

Acute inhalation toxicity : LC 50 Rat, male and female: > 2 -<= 10 mg/l
Exposure time: 4 h
Test atmosphere: vapour
Method: Test(s) equivalent or similar to OECD Test Guideline 403
Remarks: Toxic if inhaled.
High concentrations may cause central nervous system depression resulting in headaches, dizziness and nausea.

Acute dermal toxicity : LD 50 Rabbit: > 200 - <= 1000 mg/kg

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Method: Literature data

Remarks: Harmful in contact with skin.

The current CLP-based labelling of acute dermal toxicity (Category 3; H311) is inaccurate due to a mathematical error having occurred when conducting a unit conversion for the referenced dermal LD50 value of 1.5 mL/kg bw to 950 mg/kg bw. The referenced dermal LD50 is correctly converted to 1,245 mg/kg bw (Category 4; H312) based on propylene oxide relative density (0.830 at 20°C).

Skin corrosion/irritation

Components:

propylene oxide:

Species: Rabbit

Method: OECD Test Guideline 404

Remarks: Not irritating to skin., Based on available data, the classification criteria are not met.

Serious eye damage/eye irritation

Components:

propylene oxide:

Species: Rabbit

Method: Literature data

Remarks: Causes serious eye irritation.

Respiratory or skin sensitisation

Components:

propylene oxide:

Species: Guinea pig

Method: Acceptable non-standard method.

Remarks: Based on available data, the classification criteria are not met.

Carcinogenicity

Components:

propylene oxide:

Species: Mouse, (male and female)

Application Route: Inhalation

Method: Test(s) equivalent or similar to OECD Test Guideline 451

Remarks: May cause cancer.

Material	GHS/CLP Carcinogenicity Classification
propylene oxide	Carcinogenicity Category 1B

Material	Other Carcinogenicity Classification
propylene oxide	IARC: Group 2B: Possibly carcinogenic to humans

Germ cell mutagenicity

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Components:

propylene oxide:

Genotoxicity in vitro

- : Method: OECD Test Guideline 471
Remarks: May cause genetic defects.
- : Method: OECD Test Guideline 473
Remarks: May cause genetic defects.
- : Method: OECD Test Guideline 476
Remarks: May cause genetic defects.
- : Remarks: May cause genetic defects.

Reproductive toxicity

Components:

propylene oxide:

- : Species: Rat
Sex: male and female
Application Route: Inhalation

Method: Equivalent or similar to OECD Test Guideline 416
Remarks: Based on available data, the classification criteria are not met.

Effects on foetal development

- : Species: Rat, female
Application Route: Inhalation
Method: Other guideline method.
Remarks: Based on available data, the classification criteria are not met.

STOT - single exposure

Components:

propylene oxide:

Exposure routes: Inhalation
Target Organs: Respiratory Tract
Remarks: May cause respiratory irritation.

STOT - repeated exposure

Components:

propylene oxide:

Remarks: Based on available data, the classification criteria are not met.

Repeated dose toxicity

Components:

propylene oxide:

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Rat, male and female:
Application Route: Inhalation
Test atmosphere: vapour
Method: OECD Test Guideline 453
Target Organs: No specific target organs noted

Aspiration toxicity

Components:

propylene oxide:

Based on available data, the classification criteria are not met.

Further information

Components:

propylene oxide:

Remarks: Classifications by other authorities under varying regulatory frameworks may exist.

12. ECOLOGICAL INFORMATION

Basis for assessment : Information given is based on product testing.
Unless indicated otherwise, the data presented is representative of the product as a whole, rather than for individual component(s).

Ecotoxicity

Components:

propylene oxide :

Toxicity to fish (Acute toxicity) : LC50 (Oncorhynchus mykiss (rainbow trout)): 52 mg/l
Exposure time: 96 h
Method: Test(s) equivalent or similar to OECD Guideline 203
Remarks: Harmful
LL/EL/IL50 >10 <= 100 mg/l

Toxicity to crustacean (Acute toxicity) : EC50 (Daphnia magna (Water flea)): 350 mg/l
Exposure time: 48 h
Method: Test(s) equivalent or similar to OECD Guideline 202
Remarks: Practically non toxic:
LL/EL/IL50 > 100 mg/l

Toxicity to algae/aquatic plants (Acute toxicity) : EC50 (Pseudokirchneriella subcapitata (algae)): 240 mg/l
Exposure time: 96 h
Method: Test(s) equivalent or similar to OECD Test Guideline 201
Remarks: Practically non toxic:
LL/EL/IL50 > 100 mg/l

Toxicity to microorganisms (Acute toxicity) : Remarks: Practically non toxic:
LL/EL/IL50 > 100 mg/l

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Toxicity to fish (Chronic toxicity) : Remarks: Data not available

Toxicity to crustacean(Chronic toxicity) : Remarks: Data not available

Persistence and degradability

Components:
propylene oxide :

Biodegradability : Biodegradation: 89 %
Exposure time: 28 d
Method: OECD Test Guideline 301C
Remarks: Readily biodegradable.

Bioaccumulative potential

Product:

Partition coefficient: n-octanol/water : log Pow: 0.055

Components:
propylene oxide :

Bioaccumulation : Remarks: Does not bioaccumulate significantly.

Mobility in soil

Components:
propylene oxide :

Mobility : Remarks: Dissolves in water., If the product enters soil, one or more constituents will or may be mobile and may contaminate groundwater.

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Disposal methods

Waste from residues : Recover or recycle if possible.
It is the responsibility of the waste generator to determine the toxicity and physical properties of the material generated to determine the proper waste classification and disposal methods in compliance with applicable regulations.

Do not dispose into the environment, in drains or in water courses.
Waste product should not be allowed to contaminate soil or water.

Disposal should be in accordance with applicable regional, national, and local laws and regulations.
Local regulations may be more stringent than regional or national requirements and must be complied with.

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Waste, spills or used product is dangerous waste.

Contaminated packaging : Drain container thoroughly.
After draining, vent in a safe place away from sparks and fire.
Residues may cause an explosion hazard. Do not puncture, cut or weld uncleaned drums.
Send to drum recoverer or metal reclaimer.

Dispose in accordance with prevailing regulations, preferably to a recognized collector or contractor. The competence of the collector or contractor should be established beforehand.
Disposal should be in accordance with applicable regional, national, and local laws and regulations.

Disposal considerations

Dispose of in accordance with local regulations.

14. TRANSPORT INFORMATION

National Regulations

Refer to section 15 for specific national regulation.

International Regulations

ADR

UN number : 1280
Proper shipping name : PROPYLENE OXIDE
Class : 3
Packing group : I
Labels : 3
Hazard Identification Number : 33
Environmentally hazardous : no

IATA-DGR

UN/ID No. : UN 1280
Proper shipping name : PROPYLENE OXIDE
Class : 3
Packing group : I
Labels : 3

IMDG-Code

UN number : UN 1280
Proper shipping name : PROPYLENE OXIDE
Class : 3
Packing group : I
Labels : 3
Marine pollutant : no

Maritime transport in bulk according to IMO instruments

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Pollution category	: Y	
Ship type	: 2	
Product name	: Propylene oxide	

Special precautions for user

Remarks : Special Precautions: Refer to Section 7, Handling & Storage, for special precautions which a user needs to be aware of or needs to comply with in connection with transport.

Additional Information : This product may be transported under nitrogen blanketing. Nitrogen is an odourless and invisible gas. Exposure to nitrogen enriched atmospheres displaces available oxygen which may cause asphyxiation or death. Personnel must observe strict safety precautions when involved with a confined space entry.
Transport in bulk according to Annex II of Marpol and the IBC Code

15. REGULATORY INFORMATION

National regulatory information

The regulatory information is not intended to be comprehensive. Other regulations may apply to this material.

INDUSTRY SAFETY & HEALTH ACT:	Hazardous substances prohibited from manufacturing, etc., Not applicable
	Hazardous substances subject to authorization, Not applicable
	Hazardous substances subject to control, Applicable - Threshold $\geq 1\%$
	Substances established for exposure limits, Applicable
	Hazardous factor subject to keep below permissible limit, Not applicable
	Hazardous Factors Subject to Working Environment Monitoring, Not applicable
	Hazardous Factors Subject to Special Medical Examination, Not applicable
CHEMICALS CONTROL ACT:	Toxic chemical substances, Applicable - Threshold $\geq 0.1\%$

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	Authorization chemical substances, Not applicable
	Restricted chemical substances, Not applicable
	Prohibited chemical substances, Not applicable
	Accident precaution chemical substance, Applicable - Threshold $\geq 0.1\%$
DANGEROUS GOODS SAFE CONTROL ACT:	Category/Classification of dangerous material:, Category 4 Dangerous Goods (Flammable Liquids), Special inflammables
WASTES MANAGEMENT ACT:	Treat with Article 4/5/24/25 of Disposal Considerations Section.

Other requirements in domestic and other countries

The components of this product are reported in the following inventories:

AIIC	: Listed
DSL	: Listed
IECSC	: Listed
ENCS	: Listed
KECI	: Listed
NZIoC	: Listed
PICCS	: Listed
TSCA	: Listed
TCSI	: Listed

16. OTHER INFORMATION

Full text of other abbreviations

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
Muta.	Germ cell mutagenicity
STOT SE	Specific target organ toxicity - single exposure

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Abbreviations and Acronyms

AIIC - Australian Inventory of Industrial Chemicals; ANTT - National Agency for Transport by Land of Brazil; ASTM - American Society for the Testing of Materials; bw - Body weight; CMR - Carcinogen, Mutagen or Reproductive Toxicant; DIN - Standard of the German Institute for Standardisation; DSL - Domestic Substances List (Canada); ECx - Concentration associated with x% response; ELx - Loading rate associated with x% response; EmS - Emergency Schedule; ENCS - Existing and New Chemical Substances (Japan); ErCx - Concentration associated with x% growth rate response; ERG - Emergency Response Guide; GHS - Globally Harmonized System; GLP - Good Laboratory Practice; IARC - International Agency for Research on Cancer; IATA - International Air Transport Association; IBC - International Code for the Construction and Equipment of Ships carrying Dangerous Chemicals in Bulk; IC50 - Half maximal inhibitory concentration; ICAO - International Civil Aviation Organization; IECSC - Inventory of Existing Chemical Substances in China; IMDG - International Maritime Dangerous Goods; IMO - International Maritime Organization; ISHL - Industrial Safety and Health Law (Japan); ISO - International Organisation for Standardization; KECI - Korea Existing Chemicals Inventory; LC50 - Lethal Concentration to 50 % of a test population; LD50 - Lethal Dose to 50% of a test population (Median Lethal Dose); MARPOL - International Convention for the Prevention of Pollution from Ships; n.o.s. - Not Otherwise Specified; Nch - Chilean Norm; NO(A)EC - No Observed (Adverse) Effect Concentration; NO(A)EL - No Observed (Adverse) Effect Level; NOELR - No Observable Effect Loading Rate; NOM - Official Mexican Norm; NTP - National Toxicology Program; NZIoC - New Zealand Inventory of Chemicals; OECD - Organization for Economic Co-operation and Development; OPPTS - Office of Chemical Safety and Pollution Prevention; PBT - Persistent, Bioaccumulative and Toxic substance; PICCS - Philippines Inventory of Chemicals and Chemical Substances; (Q)SAR - (Quantitative) Structure Activity Relationship; REACH - Regulation (EC) No 1907/2006 of the European Parliament and of the Council concerning the Registration, Evaluation, Authorisation and Restriction of Chemicals; SADT - Self-Accelerating Decomposition Temperature; SDS - Safety Data Sheet; TCSI - Taiwan Chemical Substance Inventory; TDG - Transportation of Dangerous Goods; TECI - Thailand Existing Chemicals Inventory; TSCA - Toxic Substances Control Act (United States); UN - United Nations; UNRTDG - United Nations Recommendations on the Transport of Dangerous Goods; vPvB - Very Persistent and Very Bioaccumulative; WHMIS - Workplace Hazardous Materials Information System

Further information

Training advice : Provide adequate information, instruction and training for operators.

Sources of key data used to compile the Safety Data Sheet : The quoted data are from, but not limited to, one or more sources of information (e.g. toxicological data from Shell Health Services, material suppliers' data, CONCAWE, EU IUCLID data base, EC 1272 regulation, etc).

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Other information : A vertical bar (|) in the left margin indicates an amendment from the previous version.

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The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.

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