(S)-(−)-Styrene oxide

sc-250933

Material Safety Data Sheet

Hazard Alert Code
Key:  EXTREME  HIGH  MODERATE  LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
(S)-(-)-Styrene oxide

STATEMENT OF HAZARDOUS NATURE

NFPA

SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
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
C8-H8-O, "benzene, (epoxyethyl)-", epoxyethylbenzene, "1, 2-epoxyethylbenzene", "1, 2-epoxy-1-phenylethane", epoxystyrene, "alpha, beta-epoxystyrene", fenyloxiran, "phenethylene oxide", "1-phenyl-1, 2-epoxythane", "phenylethylene oxide", "phenyl oxirane", 1-phenyloxirane, 2-phenyloxirane, "styrene epoxide", "styrene-7, 8-oxide", "styril oxide"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability:</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Toxicity:</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Body Contact:</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Reactivity:</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Chronic:</td>
<td>3</td>
<td></td>
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</tbody>
</table>

CANADIAN WHMIS SYMBOLS
EMERGENCY OVERVIEW

RISK
Irritating to eyes.
May cause CANCER.
Harmful in contact with skin and if swallowed.
Inhalation may produce health damage*.
May produce discomfort of the respiratory system*.
Possible skin sensitiser*.
May be harmful to the foetus/embryo*.
* (limited evidence).

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

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

EYE
■ Evidence exists, or practical experience predicts, that the material may cause eye irritation in a substantial number of individuals.
■ Prolonged eye contact may cause inflammation characterised by a temporary redness of the conjunctiva (similar to windburn).
■ The vapour when concentrated has pronounced eye irritation effects and this gives some warning of high vapour concentrations.
   If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area.

SKIN
■ Skin contact with the material may be harmful; systemic effects may result following absorption.
■ The liquid may be miscible with fats or oils and may degrease the skin, producing a skin reaction described as non-allergic contact dermatitis.
The material is unlikely to produce an irritant dermatitis as described in EC Directives .
■ Open cuts, abraded or irritated skin should not be exposed to this material.
■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
   Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED
■ Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may be damaging to the health of the individual.
■ There is some evidence to suggest that the material can cause respiratory irritation in some persons.
   The body’s response to such irritation can cause further lung damage.
■ Inhalation hazard is increased at higher temperatures.
■ If exposure to highly concentrated vapour atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and unless resuscitated - death.
■ The use of a quantity of material in an unventilated or confined space may result in increased exposure and an irritating atmosphere developing.
   Before starting consider control of exposure by mechanical ventilation.

CHRONIC HEALTH EFFECTS
■ There is ample evidence that this material can be regarded as being able to cause cancer in humans based on experiments and other information.
There is limited evidence that, skin contact with this product is more likely to cause a sensitisation reaction in some persons compared to the general population.
There is some evidence from animal testing that exposure to this material may result in toxic effects to the unborn baby.
Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).
The epoxide group is an alkylating agent and thus destroys nucleotides within the cell. This may cause cancer.
Styrene oxide is mutagenic in bacterial, plant and mammalian systems and is reported to induce malignant lymphoma in mice. Skin painting studies have found little or no carcinogenic potency.
Styrene-7,8-oxide which binds covalently to DNA and shows activity in various in-vitro and in-vivo assays for genetic effects where it induces dose-related responses of chromosomal damage at low concentrations.
Styrene-7,8-oxide is detected in the blood of workers exposed to styrene.
Adducts in haemoglobin and DNA, DNA single-strand breaks/ alkali-labile sites as well as significant increases in the frequency of chromosomal damage has been found in workers exposed to styrene in the reinforced plastics industry.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>NAME</th>
<th>CAS RN</th>
<th>%</th>
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<tbody>
<tr>
<td>styrene oxide</td>
<td>20780-54-5</td>
<td>&gt;98</td>
</tr>
</tbody>
</table>
Section 4 - FIRST AID MEASURES

**SWALLOWED**
- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- For advice, contact a Poisons Information Centre or a doctor.
- Urgent hospital treatment is likely to be needed.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.

**EYE**
If this product comes in contact with the eyes:
- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**SKIN**
If skin contact occurs:
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

**INHALED**
- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.

**NOTES TO PHYSICIAN**
- for poisons (where specific treatment regime is absent):

  **BASIC TREATMENT**
  - Establish a patent airway with suction where necessary.
  - Watch for signs of respiratory insufficiency and assist ventilation as necessary.
  - Administer oxygen by non-rebreather mask at 10 to 15 L/min.
  - Monitor and treat, where necessary, for pulmonary oedema.
  - Treat symptomatically.

Section 5 - FIRE FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Vapour Pressure (mmHg)</td>
<td>&lt;0.133 @ 20 C</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>22.0</td>
</tr>
<tr>
<td>Specific Gravity (water=1)</td>
<td>1.054</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>1.1</td>
</tr>
</tbody>
</table>

**EXTINGUISHING MEDIA**
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).
- Carbon dioxide.

**FIRE FIGHTING**
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.
- Use fire fighting procedures suitable for surrounding area.

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.
- Heating may cause expansion or decomposition leading to violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO).

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

Contains low boiling substance: Closed containers may rupture due to pressure buildup under fire conditions.

May emit clouds of acrid smoke.
May emit poisonous fumes.
Heating above 200 deg C. presents a definite hazard.
FIRE INCOMPATIBILITY
- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact by using protective equipment.

MAJOR SPILLS
- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by all means available, spillage from entering drains or water courses.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
Contains low boiling substance:
Storage in sealed containers may result in pressure buildup causing violent rupture of containers not rated appropriately.
- Check for bulging containers.
- Vent periodically
- Always release caps or seals slowly to ensure slow dissipation of vapours
- DO NOT USE brass or copper containers / stirrers
- DO NOT allow clothing wet with material to stay in contact with skin
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

RECOMMENDED STORAGE METHODS
- Lined metal can, lined metal pail/ can.
- Plastic pail.
- Polyliner drum.
- Packing as recommended by manufacturer.

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.

STORAGE REQUIREMENTS
- DO NOT store near acids, or oxidising agents
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.
Precautions should be taken to prevent excessive pressure under storage or reaction conditions and to relieve such pressure should it occur.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS
The following materials had no OELs on our records

PERSONAL PROTECTION
RESPIRATOR
• Type A Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

EYE
• Safety glasses with side shields.
• Chemical goggles.
• Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lenses or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

HANDS/FEET
• Wear chemical protective gloves, eg. PVC.
• Wear safety footwear or safety gumboots, eg. Rubber

NOTE:
• The material may produce skin sensitisation in predisposed individuals. Care must be taken, when removing gloves and other protective equipment, to avoid all possible skin contact.
• Contaminated leather items, such as shoes, belts and watch-bands should be removed and destroyed.
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

OTHER
• Employees working with confirmed human carcinogens should be provided with, and be required to wear, clean, full body protective clothing (smocks, coveralls, or long-sleeved shirt and pants), shoe covers and gloves prior to entering the regulated area. [AS/NZS ISO 6529:2006 or national equivalent]
• Employees engaged in handling operations involving carcinogens should be provided with, and required to wear half-face filter-type respirators with filters for dusts, mists and fumes, or air purifying canisters or cartridges. A respirator affording higher levels of protection may be substituted. [AS/NZS 1715 or national equivalent]
• Emergency deluge showers and eyewash fountains, supplied with potable water, should be located near, within sight of, and on the same level with locations where direct exposure is likely.
• Prior to each exit from an area containing confirmed human carcinogens, employees should be required to remove and leave protective clothing and equipment at the point of exit and at the last exit of the day, to place used clothing and equipment in impervious containers at the point of exit for purposes of decontamination or disposal. The contents of such impervious containers must be identified with suitable labels. For maintenance and decontamination activities, authorized employees entering the area should be provided with and required to wear clean, impervious garments, including gloves, boots and continuous-air supplied hood.
• Prior to removing protective garments the employee should undergo decontamination and be required to shower upon removal of the garments and hood.

ENGINEERING CONTROLS
Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard “physically” away from the worker and ventilation that strategically “adds” and “removes” air in the work environment.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES
Liquid.
Does not mix with water.
Sinks in water.

<table>
<thead>
<tr>
<th>State</th>
<th>Liquid</th>
<th>Molecular Weight</th>
<th>120.15</th>
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<tbody>
<tr>
<td>Melting Range (°F)</td>
<td>-35</td>
<td>Viscosity</td>
<td>Not Available</td>
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<tr>
<td>Boiling Range (°F)</td>
<td>381</td>
<td>Solubility in water (g/L)</td>
<td>Immiscible</td>
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<tr>
<td>Flash Point (°F)</td>
<td>175</td>
<td>pH (1% solution)</td>
<td>Not applicable</td>
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<tr>
<td>Decomposition Temp (°F)</td>
<td>Not available</td>
<td>pH (as supplied)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Autoignition Temp (°F)</td>
<td>928</td>
<td>Vapour Pressure (mmHG)</td>
<td>&lt;0.133 @ 20 C</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>22.0</td>
<td>Specific Gravity (water=1)</td>
<td>1.054</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>1.1</td>
<td>Relative Vapour Density (air=1)</td>
<td>4.14</td>
</tr>
</tbody>
</table>
APPEARANCE
Liquid; does not mix well with water (0.28%). Miscible with methanol, ether, carbon tetrachloride, benzene and acetone.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY
- Polymerisation may occur at elevated temperatures.
- Polymerisation may be accompanied by generation of heat as exotherm.
- Process is self accelerating as heating causes more rapid polymerisation.
- Exotherm may cause boiling with generation of acrid, toxic and flammable vapour.

STORAGE INCOMPATIBILITY
- Contamination with polymerisation catalysts - peroxides, persulfates, oxidising agents - also strong acids, strong alkalies, will cause polymerisation with exotherm - generation of heat.
- Polymerisation of large quantities may be violent - even explosive.
- Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous

Epoxides:
- are highly reactive with acids, bases, and oxidising and reducing agents.
- react, possibly violently, with anhydrous metal chlorides, ammonia, amines and group 1 metals.
- may polymerise in the presence of peroxides or heat - polymerisation may be violent
- may react, possibly violently, with water in the presence of acids and other catalysts.

Reacts vigorously with many compounds having a labile hydrogen, including water, in the presence of catalyst such as bases, acids and certain salts.

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

Section 11 - TOXICOLOGICAL INFORMATION

styrene oxide

TOXICITY AND IRRITATION
- The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.
- The material may cause skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin.
- Exposure to the material for prolonged periods may cause physical defects in the developing embryo (teratogenesis).

WARNING: This substance has been classified by the IARC as Group 2A: Probably Carcinogenic to Humans.
Tenth Annual Report on Carcinogens: Substance anticipated to be Carcinogenic
[National Toxicology Program: U.S. Dep.

CARCINOGEN
Styrene-7,8-oxide (NB: Overall evaluation upgraded to Group 2A with supporting evidence from other relevant data) International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs Group 2A

STYRENE OXIDE
US Environmental Defense Scorecard Recognized Carcinogens Reference(s) P65

Carcinogen
CA Prop 65; IARC; NTP 11th ROC

Section 12 - ECOLOGICAL INFORMATION

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

Ecotoxicity

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Persistence: Water/Soil</th>
<th>Persistence: Air</th>
<th>Bioaccumulation</th>
<th>Mobility</th>
</tr>
</thead>
<tbody>
<tr>
<td>styrene oxide</td>
<td>LOW</td>
<td>MED</td>
<td>LOW</td>
<td>HIGH</td>
</tr>
</tbody>
</table>

Section 13 - DISPOSAL CONSIDERATIONS

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

- Containers may still present a chemical hazard/danger when empty.
- Return to supplier for reuse/recycling if possible.

Otherwise:
- If container cannot be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

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 or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible or consult manufacturer for recycling options.
- Consult State Land Waste Authority for disposal.
- Bury or incinerate residue at an approved site.
- Recycle containers if possible, or dispose of in an authorised landfill.

---

### Section 14 - TRANSPORTATION INFORMATION

**DOT:**

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<thead>
<tr>
<th>Symbols: None</th>
<th>Hazard class or Division: 6.1</th>
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<tbody>
<tr>
<td>Identification Numbers: UN2810</td>
<td>PG: III</td>
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<tr>
<td>Label Codes: 6.1</td>
<td>Special provisions: IB3, T7, TP1, TP28</td>
</tr>
<tr>
<td>Packaging: Exceptions: 153</td>
<td>Packaging: Non-bulk: 203</td>
</tr>
<tr>
<td>Packaging: Exceptions: 153</td>
<td>Quantity limitations:</td>
</tr>
<tr>
<td>Quantity limitations: Cargo aircraft only: 220 L</td>
<td>Passenger aircraft/rail: 60 L</td>
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<tr>
<td>Vessel stowage: Other: 40</td>
<td></td>
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</tbody>
</table>

Hazardous materials descriptions and proper shipping names:

**Air Transport IATA:**

<table>
<thead>
<tr>
<th>ICAO/IATA Class: 6.1</th>
<th>ICAO/IATA Subrisk: None</th>
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<td>UN/ID Number: 2810</td>
<td>Packing Group: III</td>
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<tr>
<td>Special provisions: A3</td>
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</table>

**Cargo Only**

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<tr>
<th>Packing Instructions: 663</th>
<th>Maximum Qty/Pack: 220 L</th>
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<tbody>
<tr>
<td>Passenger and Cargo</td>
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<tr>
<td>Packing Instructions: 655</td>
<td>Maximum Qty/Pack: 60 L</td>
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<tr>
<td>Passenger and Cargo Limited Quantity</td>
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<tr>
<td>Packing Instructions: Y642</td>
<td>Maximum Qty/Pack: 2 L</td>
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</table>

Shipping name: TOXIC LIQUID, ORGANIC, N.O.S. (contains styrene oxide)

**Maritime Transport IMDG:**

<table>
<thead>
<tr>
<th>IMDG Class: 6.1</th>
<th>IMDG Subrisk: None</th>
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<tbody>
<tr>
<td>UN Number: 2810</td>
<td>Packing Group: III</td>
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</table>
Section 15 - REGULATORY INFORMATION

styrene oxide (CAS: 96-09-3, 20780-53-4, 20780-54-5) is found on the following regulatory lists:

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE
■ Inhalation may produce health damage*.
■ May produce discomfort of the respiratory system*.
■ Possible skin sensitiser*.
■ May be harmful to the foetus/embryo*.
* (limited evidence).

Ingredients with multiple CAS Nos

<table>
<thead>
<tr>
<th>Ingredient Name</th>
<th>CAS</th>
</tr>
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<tbody>
<tr>
<td>styrene oxide</td>
<td>96-09-3, 20780-53-4, 20780-54-5</td>
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</table>

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.

For detailed advice on Personal Protective Equipment, refer to the following U.S. Regulations and Standards:
OSHA Standards - 29 CFR:
1910.132 - Personal Protective Equipment - General requirements
1910.133 - Eye and face protection
1910.134 - Respiratory Protection
1910.136 - Occupational foot protection
1910.138 - Hand Protection
Eye and face protection - ANSI Z87.1
Foot protection - ANSI Z41
Respirators must be NIOSH approved.

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