

Product Stewardship Summary

Epichlorohydrin

General Statement

Epichlorohydrin is a colorless, flammable liquid with extensive uses in manufacturing. It is used in the production of paper products, water treatment resins, lubricants, adhesives, and many other applications. While epichlorohydrin is both an acute contact hazard and a potential human carcinogen, it is typically not present in consumer products as it will have been reacted to form another chemical. Thus, consumer exposure to and risk from epichlorohydrin is expected to be minimal.

Chemical Identity

Name: Epichlorohydrin

Brand Names: Kymene™, Crepetrol™

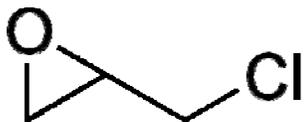
Chemical name (IUPAC): 2-(chloromethyl)oxirane

CAS number(s): 106-89-8

ES number: 203-439-8

Molecular formula: C₃H₅ClO

Structure:



Uses and Applications

Epichlorohydrin is used mainly for the manufacture of glycerol and unmodified epoxy resins, and, to a lesser extent, in the manufacture of elastomers, water treatment resins, resins used in paper manufacture, surfactants, ion exchange resins, plasticizers, dyes, pharmaceutical products, oil emulsifiers, lubricants, and adhesives. For example, Ashland's epichlorohydrin-based resins add wet/dry strength and other physical properties to paper.



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Physical/Chemical Properties

Phys/Chem Safety Assessment

Epichlorohydrin is a highly reactive, flammable liquid. Due to the high vapor pressure, measures must be taken to ensure that vapor levels do not become hazardous.

Property	Value
Form	Colorless liquid
Physical state	Liquid
Color	Colorless
Odor	Pungent, garlicky, sweet odor. Odor detection
Density	1.18 g/cm ³ @ 20 °C
Melting / boiling point	-57 °C / 117 °C
Flammability	H226: Flammable liquid and vapor.
Explosive properties	Not explosive
Self-ignition temperature	385°C
Vapor pressure	22.8 hPa @ 25 °C
Mol weight	92.52 g/mol
Water solubility	65.9 g/L @ 25°C
Flash point	40 °C
Octanol-water partition coefficient (Log _{K_{ow}})	0.45 @ 25 °C

Exposure, Hazard and Safety Assessment

The following section describes possible exposures scenarios and hazards associated with epichlorohydrin. The exposure assessment describes both the amount of and the frequency with which a chemical substance reaches a person, a population of people, or the environment. Hazard refers to the inherent properties of a substance that make it capable of causing harm to human health or the environment. The safety assessment reports the possibility of a harmful event arising from exposure to a chemical or physical agent under specific conditions. Just because a substance may possess potentially harmful properties does not mean that it automatically poses a risk. It is not possible to make that determination without understanding the exposure.

Human Health Effects

Human Exposure Assessment

The most common public exposure to epichlorohydrin comes from trace amounts in drinking water. Polymers containing epichlorohydrin are frequently used in water treatment plants and any residual free epichlorohydrin in the polymer may migrate into the water during the treatment process. Workers in plastics manufacturing facilities may be exposed to epichlorohydrin by skin contact and by breathing, though this can be minimized by the proper use of protective equipment.

Human Hazard Assessment

Effect Assessment	Result
Acute Toxicity Oral / inhalation / dermal	H302: Harmful if swallowed.
Irritation / corrosion Skin / eye / respiratory test	H311: Toxic in contact with skin. H331: Toxic if inhaled.
Sensitization	H314: Causes severe skin burns and eye damage.
Toxicity after repeated exposure Oral / inhalation / dermal	H317: May cause an allergic skin reaction.
Genotoxicity / Mutagenicity	Not classified
Carcinogenicity	Not classified
Reproductive / Developmental Toxicity	H350: May cause cancer
Aspiration hazard	Not applicable

Human Health Safety Assessment

Consumer: Consumers are typically exposed to very small amounts of epichlorohydrin in drinking water. Epichlorohydrin in water is primarily a byproduct from water treatment, and is strictly controlled by various regulations. Exposure to these quantities is not likely to be harmful.

Worker: Epichlorohydrin is acutely toxic by ingestion, skin contact, and inhalation. Contact with concentrated epichlorohydrin will cause severe skin burns and eye damage. Epichlorohydrin is considered a direct-acting mutagen, able to cause genetic damage. However, the data available for the chemical do not support classification per GHS criteria (see below). Long term exposure to epichlorohydrin may lead to an elevated risk of cancer at the points of exposure, but has not been shown to cause cancer in humans.

The International Agency for Research on Cancer (IARC) has determined that epichlorohydrin is a likely human carcinogen based on animal testing data.

Environmental Effects

Environmental Exposures

Epichlorohydrin is not expected to be toxic in normal environmental concentrations, as it rapidly degrades in water.

Environmental Hazard Assessment:

Effect Assessment	Result
Aquatic toxicity	Not classified

Fate and behavior	Result
Biodegradation	Not readily biodegradable
Bioaccumulation potential	Low potential to bioaccumulate
PBT / vPvB conclusion	Not PBT or vPvB

Environmental Safety Assessment

Epichlorohydrin is readily biodegradable and is not expected to persist in the environment. Epichlorohydrin has a low potential to bioaccumulate, and is not expected to adsorb to soil or sediment. In water, epichlorohydrin will be rapidly broken down by both biological and non-biological mechanisms. In air, epichlorohydrin will rapidly dissipate and break down. In the case of soil exposure, epichlorohydrin will mostly remain in groundwater rather than soil particulates, and will be rapidly degraded.

Risk Management Recommendations

Exposure to epichlorohydrin in the workplace can be controlled by sufficient ventilation, proper handling and storage techniques and appropriate personal protection equipment. Examples include ventilation system, proper protective equipment such as eye protection (i.e., splash proof goggles), normal work clothing which covers arms and legs, epichlorohydrin resistant gloves, and NIOSH approved respirator in situations where exposure exceeds allowable exposure limits and/or ventilation alone is not sufficient.

Exposure to epichlorohydrin in drinking water is controlled by limiting the amount of free epichlorohydrin allowed in water treatment products, as well as by preventing environmental discharge of free epichlorohydrin. Water treatment plants are required to monitor and minimize epichlorohydrin levels. Agencies such as the US EPA regulate the amount of epichlorohydrin-containing polymer used in water treatment.

Exposure to epichlorohydrin in the workplace is covered by established exposure limits. A partial list of references follows:

- US OSHA PEL: 5 ppm (8h TWA)
- ACGIH TLV: 0.5 ppm (8h TWA)
- EU and member states: <http://osha.europa.eu/en/topics/ds/oel/index.stm/members.stm>
- China: 1 mg/m³ (8h TWA)

Regulatory Agency Review

Epichlorohydrin is listed in:

- the list of REACH Registered substances ((EC) 1907/2006)
- the US TSCA inventory
- Canada's DSL list
- the Australia Inventory of Chemical Substances
- the China Inventory of Existing Chemical Substances
- the Japan Inventory of Existing and New Chemical Substances
- the Korea Existing Chemicals Inventory
- the New Zealand Inventory of Chemicals
- the Philippines Inventory of Chemicals and Chemical Substances
- Group 2A carcinogen by the International Agency for Research on Cancer (IARC)
- Reasonably Anticipated human carcinogen by the US National Toxicology Program (NTP)
- Potential occupational carcinogen by the US National Institute for Occupational Safety and Health (NIOSH)

Regulatory Information / Classification and Labeling

Under GHS, substances are classified according to their physical, health, and environmental hazards. The hazards are communicated via specific labels and the extSDS. GHS attempts to standardize hazard communication so that the intended audience (workers, consumers, transport workers, and emergency responders) can better understand the hazards of the chemicals in use.

GHS Classification:

Flammable liquids: Category 3
Acute toxicity (oral): Category 3
Acute toxicity (dermal): Category 3
Acute toxicity (inhalation): Category 3
Skin corrosion/irritation: Category 1B
Skin sensitization: Category 1A
Reproductive toxicity: Category 2 (oral – reduced male fertility)
Aquatic chronic toxicity: Category 3

Hazard Statements:

H226: Flammable liquid and vapor.
H301: Toxic if swallowed.
H311: Toxic if in contact with skin.
H331: Toxic if inhaled.
H314: Causes severe skin burns and eye damage.
H317: May cause an allergic skin reaction.
H350: May cause cancer.
H361: Suspected of damaging fertility or the unborn child.
H401: Toxic to aquatic life.
H410: Very toxic to aquatic life with long lasting effects

Signal Word:

Danger

Precautionary Statements:

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 P260: Do not breathe dust/fume/gas/mist/vapours/spray.
P280: Wear protective gloves/protective clothing/eye protection/face protection. P308+P313: IF exposed or concerned: Get medical advice/attention.
P305+P351+P338: IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P301+P330+P331: IF SWALLOWED: rinse mouth. Do NOT induce vomiting.
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 victim to fresh air and keep at rest in a position comfortable for breathing.
P403+P233: Store in a well-ventilated place. Keep container tightly closed.
P501: Dispose of contents/container to licensed, permitted incinerator, or other thermal destruction device.

Hazard Pictograms:



Conclusion

With proper workplace controls, Epichlorohydrin serves as an essential tool in the creation of many vital products. Exposure to the general public is minimal, and not expected to be harmful.

Contact Information with Company

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Additional Information

For more information on GHS, visit <http://www.osha.gov/dsg/hazcom/ghsguideoct05.pdf> or http://live.unece.org/trans/danger/publi/ghs/ghs_welcome_e.html.
Ashland product stewardship summaries are located at <http://www.ashland.com/sustainability/product/product-stewardship>

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REACH registration is specific to Importers/Manufacturers that place the chemical on the EU market, and is specific to registered uses. Inclusion on the list of REACH Registered Substances does not automatically imply registration by Ashland.

Inclusion on the New Zealand Inventory of Chemicals applies only to the pure substance listed. The importer of record must determine whether or not their substances are in compliance.