HEXION™

Product Stewardship Summary

Epichlorohydrin

Introduction

This document is intended to provide the general public with a high-level overview of epichlorohydrin, including its uses, properties, and health and environmental considerations. It is not intended to replace the Safety Data Sheet (SDS), which is available from suppliers. All purchasers and users of this substance should read the SDS carefully to understand the hazards and appropriate precautions and practices for safe use of this substance. It is also not intended to replace or supercede manufacturer's instructions and warnings for products that may contain this substance. This information is being provided for information only. This information does not constitute a product specification, warranty, or approval for specific uses. This information does not alter or affect Hexion's standard terms and conditions of sale. It is the sole responsibility of the purchaser to select a particular Hexion product, determine its suitability for the purchaser's application, follow appropriate handling and processing procedures, and to comply with all applicable statutory, regulatory, compatibility and industry requirements and standards for testing, safety, efficacy and labeling.

Chemical Identity

Epichlorohydrin
(i.e., 1-chloro-2,3-epoxy-propane)
(CAS No. 106-89-8) has a molecular formula of C_3H_5OCl.

Synonyms:
ECH, glycerol epichlorohydrin, 2,3-epoxypropyl chloride, (chloromethyl)ethylene oxide, chloromethyloxirane, oxirane, 2-(chloromethyl), chloropropylene oxide

Uses

Epichlorohydrin is a man-made chemical intermediate used in a wide variety of manufacturing applications, including epoxy and phenoxy resins and textiles, ion exchange resins, rubbers, paper saturated resins and agricultural products. The most familiar epoxy resin is used as a coating on the inside of food and beverage cans to prevent rusting. Epichlorohydrin is also used as a solvent and in the synthesis of glycerol. Other uses include insect fumigation and as an intermediate for the formation of glycidyl acrylate derivatives such as those used in the manufacture of eyeglass lenses.

Physical/Chemical Properties

Epichlorohydrin is a colorless, volatile and flammable liquid with an irritating chloroform-like odor which emits toxic fumes when heated to decomposition. It is only slightly soluble in water but miscible with many organic solvents; other properties include:

- Molecular Weight (g/mol): 92.53
- Melting point: -57.1°C (-71.9°F)
- Boiling point: 116°C (241°F)
- Degradation point: 217°C
- Specific gravity: 1.18 @ 20°C
- Vapor pressure: 12.5 @ 20°C (68°F)
- Solubility in water: 1–10%
- Vapor Density (Air=1): 3.3
- Odor thresholds:
  - Mean odor recognition (ppm): 10
  - Odor recognized by majority of individuals (ppm): 25

General Health Effects

Acute effects: Due to its vapor pressure, excessive vapor concentrations of epichlorohydrin can readily occur at room temperature and may cause unconsciousness and even death. Acute inhalation exposure to epichlorohydrin in the workplace can cause irritation to the eyes, respiratory tract, and skin of workers. At high levels of exposure, nausea, vomiting, cough, labored breathing, inflammation of the lung, pulmonary edema, and kidney lesions may be observed in humans. Lung injury, which can be delayed following exposure, can result from inhalation of epichlorohydrin vapor at sufficient concentrations.

Chronic effects: Repeated inhalation of epichlorohydrin vapor (or prolonged skin contact with the liquid) has caused adverse effects in the upper respiratory tract and liver and kidney injury to laboratory animals as well as humans. Chronic occupational exposure of humans to epichlorohydrin has been associated with high levels of respiratory tract illness and adverse effects on the blood.

In animal studies, effects on reproduction have been reported mainly as a reversible decrease in fertility in male rats; in exposed pregnant females there are no effects on the development of fetuses. A number of epidemiological studies which investigated epichlorohydrin exposure and health effects in workers have shown no association with effects on reproduction.[1–8]

Carcinogenic Potential

Epichlorohydrin causes cancer in various laboratory animals following prolonged exposure. Based on this evidence, the International Agency for Research on Cancer (IARC) classifies epichlorohydrin in the 2A category (i.e. probably carcinogenic to humans). In the U.S., epichlorohydrin is considered by the Occupational Safety and Health Administration (OSHA) to be a potential carcinogen. Also in the U.S. in the 11th Report on Carcinogens, epichlorohydrin is considered as *reasonably anticipated to be a human carcinogen* based on sufficient evidence of carcinogenicity in experimental animals (IARC 1976, 1982, 1987, 1999). The American Conference of Governmental Industrial Hygienists (ACGIH) places epichlorohydrin in cancer class A3 (confirmed animal carcinogen with unknown relevance to humans).[1–6,9,10]

Environmental Effects

Environmental Fate Information

In the event of a spill, because epichlorohydrin is relatively volatile it would readily evaporate from near-surface soils and other solid surfaces. If released into water it will be lost primarily by evaporation (half-life 29 hr in a typical river) and hydrolysis (half-life 8.2 days). It does not adsorb appreciably to sediment. If spilled on land, it will also evaporate and leach into the groundwater where it will hydrolyze.

Biodegradation and chemical reactions with reactive species in soil and water may accelerate the loss of epichlorohydrin, but data from field studies are lacking. In the atmosphere, epichlorohydrin degrades by reaction with sunlight produced hydroxyl (i.e., OH) radicals (≈ half-life 4 days). With an estimated log bioconcentration factor of 0.66, epichlorohydrin will not bioconcentrate appreciably in aquatic organisms and is readily biodegradable.[3,4,6]

Aquatic and/or Terrestrial Toxicity

Because of its rapid evaporation and/or degradation in water, epichlorohydrin is not expected to be toxic to aquatic organisms. Acute toxicity levels for epichlorohydrin measured in a variety of aquatic organisms, including various species of fish and invertebrates (e.g.,daphnids) do not indicate a concern for low level toxic effects. Epichlorohydrin is mildly acutely toxic to fish (various species) and crustaceans (e.g., Daphnia) with LC50s from 10–30 mg/l and 30–40 mg/l, respectively.[3,4,6]

Exposure Potential

Because of its use primarily as a chemical intermediate, the primary source of exposure to epichlorohydrin is from occupational sources. With respect to potential consumer exposure, since epichlorohydrin is used to manufacture other products, end-use consumer products are expected to contain no more than trace levels of epichlorohydrin, if any at all with resulting exposures expected to be low to negligible. No data on measured concentrations of epichlorohydrin in environmental media, food or water are available as industrial emissions are also negligible.[3,4,5,6]

Risk Management Recommendations

Risk management procedures are mainly for individuals who might come into contact with epichlorohydrin in an occupational setting. This entails maintaining adequate local ventilation in order to ensure that air concentrations fall below applicable requirements and recommended exposure limits. When there is a likelihood of unknown exposures that might exceed these values, respiratory protection is mandatory using government-required or appropriate apparatus to avoid irritation and/or to comply with acceptable limits, such as face masks with correct cartridges and self-contained breathing apparatus, depending upon the situation. Proper hand (gloves), eyes (protective goggles or face shield) and skin (neoprene apron and boots) protection should also be used where necessary. In addition, showers and eyewash stations should also be maintained.[5,6,8]

Product Stewardship Commitment

Epichlorohydrin is used in a wide variety of manufacturing applications. The chemistry of epichlorohydrin continues to make it a versatile and valuable material, with applications that enhance the quality of modern life. We are committed to responsible plant operations that protect the health and safety of our associates, neighbors and the environment. As responsible stewards of our products, we are committed to helping our customers with regulatory compliance, safe product use and product enhancements. We continue to support scientific research, compliance awareness and education programs designed to advocate the safe use of epichlorohydrin.

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HXN-162 02/15