

Product Safety Assessment

DOW™ Epichlorohydrin

Product Safety Assessment documents are available at www.dow.com/productsafety/finder/.

Select a Topic:

[Names](#)
[Product Overview](#)
[Manufacture of Product](#)
[Product Description](#)
[Product Uses](#)
[Exposure Potential](#)
[Health Information](#)
[Environmental Information](#)
[Physical Hazard Information](#)
[Regulatory Information](#)
[Additional Information](#)
[References](#)

Names

- CAS No. 106-89-8
- DOW™ epichlorohydrin
- EPI
- ECH
- (Chloromethyl)ethylene oxide
- α-Epichlorohydrin
- 1,2-Epoxy-3-chloropropane
- (D,L)-α-Epichlorohydrin
- 1-Chloro-2,3-epoxypropane
- 2,3-Epoxypropyl chloride
- 2-(Chloromethyl)oxirane
- Chloro-1,2-epoxypropane
- Chloropropene-1,2-oxide
- Chloromethyloxirane
- Chloropropylene oxide
- γ-Chloropropylene oxide
- Glycerol epichlorohydrin
- Epichlorohydrin glycerol
- Glycidyl chloride
- Oxirane, (chloromethyl)-(9Cl)
- Glycerol epichlorohydrin
- Propane, 1-chloro-2,3-epoxy-(6Cl,8Cl)

[Back to top](#)

Product Overview

- DOW™ epichlorohydrin is a clear, colorless liquid with a pungent odor. Epichlorohydrin is a highly reactive chemical.¹ For further details, see [Product Description](#).
- DOW epichlorohydrin is mainly used as a chemical building block (intermediate) for the production of epoxy resins. Epichlorohydrin is also used to make water-treatment chemicals, synthetic glycerin, and other resins and chemicals.² For further details, see [Product Uses](#).
- DOW epichlorohydrin is manufactured and consumed in closed systems with engineering controls to prevent the release of fugitive emissions. Consumers are not likely to contact this material.³ For further details, see [Exposure Potential](#).
- Eye contact may cause severe irritation and corneal injury, possibly blindness. Brief skin contact may cause burns. Prolonged or widespread skin contact may result in absorption of harmful amounts. This material has caused allergic skin reactions in humans. Easily attainable vapor concentrations may cause unconsciousness and death. Epichlorohydrin is an aspiration hazard and has caused cancer in laboratory animals.⁴ For further details, see [Health Information](#).
- Epichlorohydrin is biodegradable, not likely to accumulate in the food chain, and slightly to moderately toxic to aquatic organisms.⁵ For further details, see [Environmental Information](#).
- Epichlorohydrin liquid and vapor are flammable. The vapor is an explosion hazard. Epichlorohydrin is stable under recommended storage and use conditions. Elevated temperatures can cause hazardous polymerization. Avoid ignition sources and two-phase storage with water. Avoid contact with oxidizing materials such as sodium hypochlorite and

[®]™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

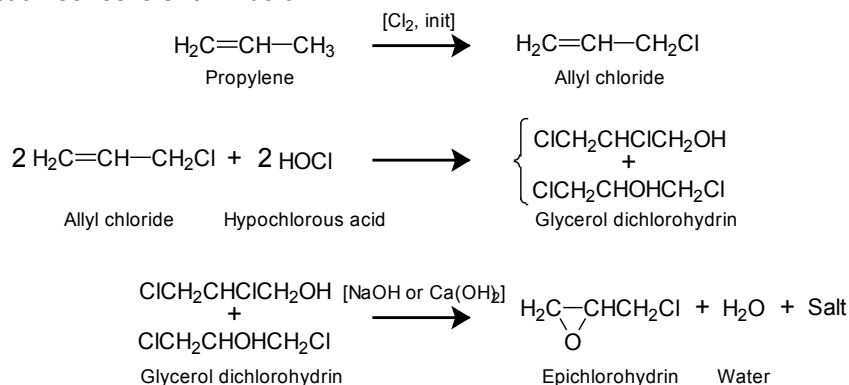
chlorine. Avoid contact with amines, acids, bases, and clay- or cellulose-based absorbents.⁶ For further details, see [Physical Hazard Information](#).

[Back to top](#)

Manufacture of Product⁷

- **Capacity** – The Dow Chemical Company and its global affiliates are the largest global producers of epichlorohydrin, with production facilities in Freeport, Texas, USA, and Stade, Germany. Dow's 2010 production capacity was 480 metric kilotonnes (1 billion pounds). Global epichlorohydrin consumption for 2009 was estimated at 1,100 metric kilotonnes (2.4 billion pounds).
- **Process** – DOW™ epichlorohydrin is produced by a three-step process:
 - Chlorination of propylene to allyl chloride
 - Reaction of allyl chloride with hypochlorous acid to produce glycerol dichlorohydrin
 - Reaction of glycerol dichlorohydrin with sodium- or calcium hydroxide to produce epichlorohydrin.

The reaction series is shown below.



[Back to top](#)

Product Description⁸

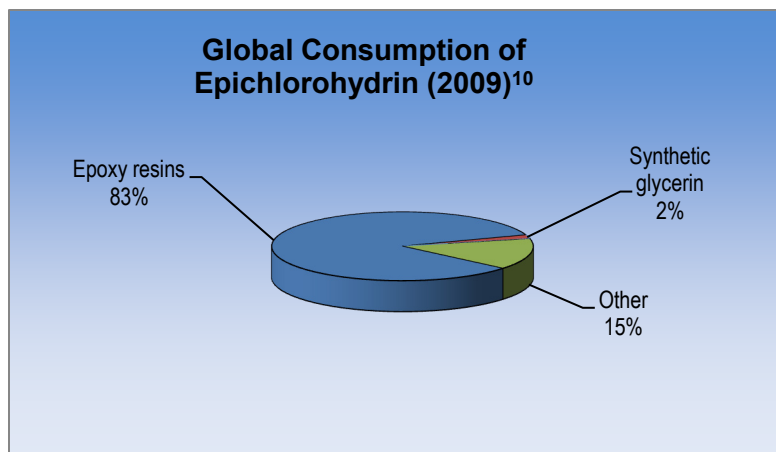
DOW™ epichlorohydrin is a clear, colorless liquid with a sweet, pungent odor. Epichlorohydrin is a highly reactive chemical that evaporates readily (is volatile) and is slightly soluble in water.

[Back to top](#)

Product Uses^{9,10}

Epichlorohydrin is a chemical raw material used to produce the following:

- **Epoxy resins** – protective coatings, bonding adhesives, electrical laminates and encapsulations, glass-fiber reinforced vessels, pipes, and structural materials
- **Polyamide-epichlorohydrin resins** – to improve wet paper strength
- **Synthetic glycerin**
- **Water-treatment chemicals**



[®]™Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

- **Other** – surfactants, ion-exchange resins, elastomers, flame retardants, glycidyl ethers, glycidyl methacrylate, quaternary amines

[Back to top](#)

Exposure Potential^{11,12,13}

DOW™ epichlorohydrin is a chemical intermediate used for the production of other chemicals. Based on this, the public could be exposed through:

- **Workplace exposure** – Exposure can occur in facilities that manufacture epichlorohydrin or use it as a raw material. It is produced, stored, transported, and consumed in closed systems, and direct contact with workers is minimal. Those working with this material in manufacturing operations could be exposed during maintenance, sampling, testing, or other procedures. Each manufacturing facility should have a thorough training program for employees and appropriate work processes, ventilation, and safety equipment in place to limit exposure. See [Health Information](#).
- **Consumer exposure to products containing DOW epichlorohydrin** – Dow does not sell epichlorohydrin for direct consumer use. End-use consumer products are expected to contain only trace levels of epichlorohydrin based on its use as a chemical intermediate and in polymers. Consumer products that may contain epoxy surface coatings derived from epichlorohydrin include automobiles and appliances. See [Health Information](#).
- **Environmental releases** – DOW epichlorohydrin is used entirely in closed systems, therefore, releases to the environment will be minimal. Epichlorohydrin released to the air will degrade through interaction with hydroxyl radicals. If introduced to water or soil, epichlorohydrin will degrade through hydrolysis and biodegradation, including removal by biological wastewater-treatment facilities. Epichlorohydrin is slightly to moderately toxic to fish and other aquatic organisms on an acute basis. See [Environmental](#), [Health](#), and [Physical Hazard Information](#).
- **Large release** – Industrial spills or releases are infrequent and generally contained. If a large spill does occur, the focus is on containing the spill to prevent contamination of soil, surface water, or groundwater. Use sand to contain the spill. Do not use clay- or cellulose-based absorbents. Evacuate personnel upwind and out of low-lying areas. Eliminate all sources of ignition in the vicinity of the spill or released vapor to avoid fire or explosion. Ventilate the area. This material is a vapor explosion hazard. Vapors are heavier than air and can travel long distances and accumulate in low-lying areas. Warn the public of any downwind explosion hazard. Check area with a combustible-gas detector before reentry. Only trained and properly protected personnel must be involved in clean-up operations. Use foam to smother or suppress vapors. Ground and bond all containers and handling equipment. Pump recovered material with explosion-proof equipment and collect in suitable and properly labeled containers. Use appropriate safety equipment. See [Environmental](#), [Health](#), and [Physical Hazard Information](#).
- **In case of fire** – Keep people away. Isolate the fire and deny unnecessary entry. Use water fog or fine spray, dry-chemical or carbon-dioxide extinguishers, or foam to fight the fire. Alcohol-resistant foams are preferred. A direct water stream may spread the fire. Firefighters must wear positive-pressure, self-contained breathing apparatus (SCBA) and protective firefighting clothing. Stay up wind and out of low-lying areas where gases (fumes) can accumulate. Follow emergency procedures carefully. See [Environmental](#), [Health](#), and [Physical Hazard Information](#).

For more information, request the Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

Health Information^{14,15}

Eye contact – Contact may cause severe irritation with corneal injury, which may result in permanent impairment of vision, even blindness. Vapor may cause irritation experienced as mild discomfort and redness.

Skin contact – Brief contact may result in a burn. Prolonged contact may cause severe burns. Symptoms may include pain, severe local redness, swelling, and tissue damage. Prolonged or widespread contact may result in absorption of harmful amounts. Epichlorohydrin has caused allergic skin reactions in humans.

Inhalation – Easily attainable vapor concentrations may cause unconsciousness and death. Effects may be delayed. Excessive inhalation exposure may cause irritation to the nose and throat with possible lung injury. Signs and symptoms of excessive exposure may include difficulty in breathing.

Ingestion – Epichlorohydrin is moderately toxic if swallowed. Small amounts swallowed incidental to normal handling operations are not likely to cause injury; however, swallowing large amounts may cause serious injury, even death. Aspiration into the lungs may occur during ingestion or vomiting resulting in rapid absorption and injury to other body systems.

Repeated exposure – In humans, effects have been reported on the kidneys and lungs. In animals, effects have been reported on the liver and kidneys.

Cancer information – This material has caused cancer in laboratory animals. Epidemiology studies have not demonstrated a clear link between human exposure and cancer or heart disease.

Other – In animal studies, epichlorohydrin has been toxic to the fetus, but only at doses that were toxic to the mother, and has been shown to interfere with fertility in males. Animal genetic toxicity tests were positive.

For more information, request the Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

Environmental Information^{16,17}

The use pattern of epichlorohydrin in epoxy resins and as an industrial intermediate in closed systems indicates a limited potential for damage to the environment. Consistent with this use pattern, estimates of releases to the environment are small (approximately 100,000 kg/year in the United States from all industries).

Epichlorohydrin is unlikely to persist in the environment. It hydrolyzes (breaks down) in water and is degraded in the air by hydroxyl radicals. It is considered readily biodegradable (BOD₂₀ >40%), which suggests that it will be removed from water and soil environments, including removal by biological wastewater-treatment facilities.

Epichlorohydrin is not likely to accumulate in the food chain (bioconcentration potential is low) and is considered slightly to moderately toxic to fish and other aquatic organisms on an acute basis.

For more information, request the Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

[®]Trademark of The Dow Chemical Company (“Dow”) or an affiliated company of Dow

Physical Hazard Information¹⁸

Epichlorohydrin liquid and vapor are flammable. The vapor is an explosion hazard. Epichlorohydrin vapor is heavier than air and can travel long distances and accumulate in low-lying areas. Ignition or flashback could occur. Epichlorohydrin is stable under recommended storage and use conditions.

Elevated temperatures can cause hazardous polymerization, an uncontrolled chemical reaction that releases a large amount of heat and can rapidly build-up pressure in closed systems. Polymerization can be catalyzed by contact with zinc, aluminum, amines, copper, lead, strong acids, and strong bases. Avoid ignition sources, such as static build-up, heat, spark, and flame. Avoid two-phase storage with water, which can result in a heat-generating chemical reaction.

Avoid contact with oxidizing materials such as sodium hypochlorite and chlorine. Avoid contact with amines, acids, bases, and clay- or cellulose-based absorbents. This material must be stored under nitrogen. Electrically bond and ground all containers and handling equipment before transferring or using this material.

For more information, request the Safety Data Sheet from the [Dow Customer Information Group](#).

[Back to top](#)

Regulatory Information

Regulations may exist that govern the manufacture, sale, transportation, use, and/or disposal of DOW™ epichlorohydrin. These regulations may vary by city, state, country, or geographic region. Information may be found by consulting the [Safety Data Sheet](#), [Safe Handling and Storage Manual](#), or [Contact Us](#).

[Back to top](#)

Additional Information

- Request the Safety Data Sheet from the [Dow Customer Information Group](#) (<http://www.dow.com/assistance/dowcig.htm>)
- Contact Us (<http://epoxy.dow.com/epoxy/contact/index.htm>)
- *DOW™ Epichlorohydrin Product Stewardship Manual: Safe Handling and Storage*, The Dow Chemical Company, Form No. 296-01301-0507X SD, May 2007 (http://msdssearch.dow.com/PublishedLiteratureDOWCOM/dh_0100/0901b80380100836.pdf?filepath=epoxy/pdfs/noreg/296-01301.pdf&fromPage=GetDoc)
- Greiner, Elvira O. Camara, with Yokose, Kazuteru, "Marketing Research Report: Epichlorohydrin," *Chemical Economics Handbook*, SRI Consulting, September 2010
- "Epichlorohydrin," Hazardous Substance Fact Sheet, New Jersey Department of Health and Senior Services, Revised January 2011 (<http://nj.gov/health/eoh/rtkweb/documents/fs/0828.pdf>)
- "1-Chloro-2,3-epoxypropane (Epichlorohydrin), CAS No. 106-89-8," *Screening Information Data Set (SIDS) Initial Assessment Report for SIAM 22*, Organisation for Economic Cooperation and Development (OECD), The Society of the Plastics Industry, Inc., April 18–21, 2006, Paris, France (<http://webnet.oecd.org/Hpv/UI/handler.axd?id=5e078f0b-c810-435c-9008-6e6be119ddc2>)

For more business information about DOW epichlorohydrin, visit the [Dow Epoxy](#) web site at <http://epoxy.dow.com/>.

[Back to top](#)

¹⁸™Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow

References

- ¹ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Hazards Identification and Physical and Chemical Properties.
- ² Greiner, Elvira O. Camara, with Yokose, Kazuteru, "Marketing Research Report: Epichlorohydrin," *Chemical Economics Handbook*, SRI Consulting, September 2010, pages 13–17.
- ³ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Fire Fighting Measures, Accidental Release Measures, and Ecological Information.
- ⁴ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Hazards Identification and Toxicological Information.
- ⁵ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Ecological Information.
- ⁶ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Hazards Identification and Stability and Reactivity.
- ⁷ Camara Greiner, Elvira, O., with Yokose, Kazuteru, "Marketing Research Report: Epichlorohydrin," *Chemical Economics Handbook*, SRI Consulting, September 2010, pages 5–10.
- ⁸ *DOW™ Epichlorohydrin Product Stewardship Manual: Safe Handling and Storage*, The Dow Chemical Company, Form No. 296-01301-0507X SD, May 2007, pages 6–7 and 12.
- ⁹ *DOW™ Epichlorohydrin Product Stewardship Manual: Safe Handling and Storage*, The Dow Chemical Company, Form No. 296-01301-0507X SD, May 2007, pages 10–11.
- ¹⁰ Greiner, Elvira O. Camara, with Yokose, Kazuteru, "Marketing Research Report: Epichlorohydrin," *Chemical Economics Handbook*, SRI Consulting, September 2010, pages 5, 7, 13–17.
- ¹¹ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Fire Fighting Measures, Accidental Release Measures, and Ecological Information.
- ¹² *DOW™ Epichlorohydrin Product Stewardship Manual: Safe Handling and Storage*, The Dow Chemical Company, Form No. 296-01301-0507X SD, May 2007, pages 23–24.
- ¹³ "1-Chloro-2,3-epoxypropane (Epichlorohydrin), CAS No. 106-89-8," *Screening Information Data Set (SIDS) Initial Assessment Report for SIAM 22*, Organisation for Economic Cooperation and Development (OECD), The Society of the Plastics Industry, Inc., April 18–21, 2006, Paris, France, page 2.
- ¹⁴ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Hazards Identification and Toxicological Information.
- ¹⁵ *DOW™ Epichlorohydrin Product Stewardship Manual: Safe Handling and Storage*, The Dow Chemical Company, Form No. 296-01301-0507X SD, May 2007, pages 12–14.
- ¹⁶ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, page 8.
- ¹⁷ "1-Chloro-2,3-epoxypropane (Epichlorohydrin), CAS No. 106-89-8," *Screening Information Data Set (SIDS) Initial Assessment Report for SIAM 22*, Organisation for Economic Cooperation and Development (OECD), The Society of the Plastics Industry, Inc., April 18–21, 2006, Paris, France, page 2.
- ¹⁸ *Epichlorohydrin Material Safety Data Sheet*, The Dow Chemical Company, April 6, 2011, Hazards Identification and Stability and Reactivity.

[Back to top](#)

NOTICES:

As part of its 2015 Sustainability Goals, Dow has committed to make publicly available safety assessments for its products globally. This product safety assessment is intended to give general information about the chemical (or categories of chemicals) addressed. It is not intended to provide an in-depth discussion of health and safety information. Additional information is available through the relevant Safety Data Sheet, which should be consulted before use of the chemical. This product safety assessment does not replace required communication documents such as the Safety Data Sheet.

The information herein is supplied upon the condition that the persons receiving same will make their own determination as to its suitability for their purposes prior to use. In no event will Dow be responsible for damages of any nature whatsoever resulting from the use of or reliance upon the information herein or the product to which that information refers.

Nothing contained herein is to be construed as a recommendation to use any product, process, equipment or formulation in conflict with any patent, and Dow makes no representation or warranty, express or implied, that the use thereof will not infringe any patent.

NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE OR OF ANY OTHER NATURE ARE MADE HEREUNDER WITH RESPECT TO INFORMATION OR THE PRODUCT TO WHICH INFORMATION REFERS.

Dow makes no commitment to update or correct any information that appears on the Internet or on its World-Wide Web server. The information contained in this document is supplemental to the Internet Disclaimer, www.dow.com/homepage/term.asp.

[Back to top](#)

Form No. 233-00239-MM-0612



®™ Trademark of The Dow Chemical Company ("Dow") or an affiliated company of Dow
