

SAFETY DATA SHEET

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Version: 5th

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Regulation: According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

1. Identification

1.1 Product identifier

1.1.1 Product of name: ECH

1.1.2 Other means of identification: Epichlorohydrin

1.2 Recommended use of the chemical and restrictions on use

1.2.1 Recommended use: It is also used for the base material of epoxy resin, solvent, stabilizer uses.

1.2.2. Restrictions on use: Do not use for purposes other than those recommended

1.3 Details of the supplier of the safety data sheet

1.3.1 Manufacturer

Company name: Hanwha Solutions Co, Ltd.

Address: Yeosu plant, Hanwha Solutions Co, Ltd., 117, Yeosusandan 3-ro, Yeosu-si, Jeollanam-do, Korea

Prepared by: ECH Production Team

Contact Telephone: (Yeosu plant) +82-61-688-1864

1.3.2 Supplier & Distributor

Company name: Hanwha Solutions Co, Ltd.

Address: Hanwha Bldg., Janggyo-dong, Jung-gu, Seoul, Korea

Prepared by: CA Domestic Sales Team

Contact Telephone: +82-10-3110-0852

1.4 Emergency phone number

Emergency phone: +82-10-3110-0852

2. Hazard(s) identification

2.1 Classification of the substance or mixture

According to Regulation 2012 OSHA Hazard Communication Standard; 29 CFR Part 1910.1200

Physical / Chemical Hazards:

Flammable liquids: Category 3

Health Hazards:

Acute toxicity (oral): Category 3

Acute toxicity (dermal): Category 3

Acute toxicity (inhalation:vapours): Category 3

Skin corrosion/irritation: Category 1B

Serious eye damage /eye irritation: Category 1

Skin sensitization: Category 1

Carcinogenicity: Category 1B

Environmental Hazards: Applicable

2.2 Label elements, including precautionary statements

o Pictogram and symbol:



o Signal word: Danger

o Hazard statements:

- H226 Flammable liquid and vapour
- H301 Toxic if swallowed.
- H311 Toxic in contact with skin.
- H314 Causes severe skin burns and eye damage.
- H317 May cause an allergic skin reaction.
- H318 Causes serious eye damage.
- H331 Toxic if inhaled.
- H350 May cause cancer.

o 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.
- P260 Do not breathe dust/fume/gas/mist/vapours/spray.
- P261 Avoid breathing dust/fume/gas/mist/vapours/spray.
- P264 Wash thoroughly after handling the treated area.
- P270 Do not eat, drink or smoke when using this product.
- P271 Use only outdoors or in a well-ventilated area.
- P272 Contaminated work clothing should not be allowed out of the workplace.
- P280 Wear protective gloves/protective clothing/eye protection/face protection.
- P281 Use personal protective equipment as required.

- Treatment:

- P301+P310 If swallowed: Immediately call a poison center or doctor/physician.
- P301+P330+P331 If swallowed: Rinse mouth. Do not induce vomiting.
- P302+P352 If on skin: Wash with plenty of soap and water.
- 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.
- 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.
- P310 Immediately call a poison center or doctor/physician.
- P311 Call a poison center or doctor/physician.
- P312 Call a poison center or doctor/physician you feel unwell.
- P321 Specific treatment (see information on this label).
- P322 Specific measures (see information on this label).
- P330 Rinse mouth.
- P333+P313 If skin irritation or rash occurs: Get medical advice/attention.

- P361 Remove/Take off immediately all contaminated clothing.
 P363 Wash contaminated clothing before reuse.
 P370+P378 In case of fire: Use the fire extinguishing agent for extinction.

- Storage:

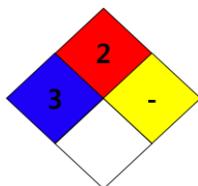
- P403+P233 Store in a well-ventilated place. Keep container tightly closed.
 P403+P235 Store in a well-ventilated place. Keep cool.
 P405 Store locked up.

- Disposal:

- P501 Dispose the contents/container in accordance with local/regional/national/international regulations.

2.3 Other hazard information not included in hazard classification (NFPA)

- o Health: 3
- o Flammability: 2
- o Reactivity: -



3. Composition/information on ingredients

Component	Common name and synonyms	CAS No.	Conc. / %
1-chloro-2,3-epoxypropane	2,3-epoxypropyl chloride	106-89-8	99.9
Hydrogen chloride	Chlorohydric acid	7647-01-0	≤0.1
Iron	-	7439-89-6	≤0.1

4. First-aid measures

4.1 Description of first aid measures

Eye contact

- Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
- Get immediate medical advice/attention.

Skin contact

- If on skin (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
- If skin irritation or rash occurs: Get medical advice/attention.
- Wash contaminated clothing before reuse.
- Get immediate medical advice/attention.
- Remove and isolate contaminated clothing and shoes.
- For minor skin contact, avoid spreading material on unaffected skin.
- In case of burns, immediately cool affected skin for as long as possible with cold water. Do not remove clothing if adhering to skin.
- Wash skin with soap and water.

Inhalation

- Immediately get immediate medical advice/attention.
- If exposed to excessive levels of dusts or fumes, remove to fresh air and get medical attention if cough or other symptoms develop.

Ingestion

- If swallowed: Immediately call a poison center or doctor/physician.
- If swallowed: Rinse mouth. Do not induce vomiting.
- Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

4.2 Most important symptoms and effects, both acute and delayed

- Inhalation: May cause acute toxicity of inhalation.
- Skin contact: May cause severe skin corrosion.
- Eye contact: May cause severe eye damage.

4.3 Indication of immediate medical attention and notes for physician

- Exposures require specialized first aid with contact and medical follow-up .
- Ensure that medical personnel are aware of the material(s) involved and take precautions to protect themselves.

5. Fire-fighting measures

5.1 Extinguishing media

- **Suitable extinguishing media:** CO₂, dry chemical, water spray, alcohol-resistant foam
- **Unsuitable extinguishing media:** Straight streams

5.2 Specific hazards arising from the chemical

- Thermal decomposition products: Gas(hydrochloric acid, carbon monoxide, phosgene), irritating, corrosive and/or toxic vapour
- Flammable liquid and vapour
- May violently polymerize and result in fire and explosion.
- Vapors may travel to a source of ignition and ignite.
- Material may produce irritating and highly toxic gases from decomposition by heat and combustion during burning.
- May form explosive mixtures at temperatures at or above the flashpoint.
- Containers may explode when heated.
- HIGHLY FLAMMABLE: Will be easily ignited by heat, sparks or flames.
- Spilled material may create fire or explosion hazard.

5.3 Special protective equipment and precautions for fire-fighters

- Rescuers should put on appropriate protective gear.
- Evacuate area and fight fire from a safe distance.
- Many liquids are lighter than water.
- Most vapors are heavier than air. They will spread along ground and collect in low or confined areas
- Substance may be transported hot.
- Substance may be transported in a molten form.
- Dike fire-control water for later disposal; do not scatter the material.
- Move containers from fire area if you can do it without risk.
- Fire involving Tanks; Fight fire from maximum distance or use unmanned hose holders or monitor nozzles.
- Fire involving Tanks; Cool containers with flooding quantities of water until well after fire is out.
- Fire involving Tanks; Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
- Fire involving Tanks; Always stay away from tanks engulfed in fire.

- Fire involving Tanks; For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

6. Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

- Avoid breathing dust/fume/gas/mist/vapours/spray.
- The very fine particles may cause a fire or explosion, eliminate all ignition sources.
- Clean up spills immediately, observing precautions in Protective Equipment section.
- Isolate hazard area.
- Keep unnecessary and unprotected personnel from entering.
- Eliminate all ignition sources.
- All equipment used when handling the product must be grounded.
- Stop leak if you can do it without risk.
- Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- A vapor suppressing foam may be used to reduce vapors.

6.2 Environmental precautions

- Prevent entry into water ways : sewers, basements or confined areas.

6.3 Methods and materials for containment and cleaning up

- Dike and collect water used to fight fire.
- Absorb spills with inert material (e.g., dry sand or earth), then place in a chemical waste container.
- Reduce dust and prevent scattering by moistening with water.
- Absorb the liquid and scrub the area with detergent and water.
- Large Spill; Dike far ahead of liquid spill for later disposal.
- Use clean non-sparking tools to collect absorbed material.

7. Handling and storage

7.1 Precautions for safe handling

- Do not handle until all safety precautions have been read and understood.
- Use explosion-proof electrical/ventilating/lighting equipment.
- Use only non-sparking tools.
- Take precautionary measures against static discharge.
- Wash thoroughly after handling the treated area.
- Do not eat, drink or smoke when using this product.
- Use only outdoors or in a well-ventilated area.
- Contaminated work clothing should not be allowed out of the workplace.
- Do not pressurize, cut, weld, braze, solder, drill, grind, or expose such containers to heat, flame, sparks, static electricity, or other sources of ignition.
- Follow all SDS/label precautions even after container is emptied because they may retain product residues.
- Loosen closure cautiously before opening.
- Avoid prolonged or repeated contact with skin.
- All equipment used when handling the product must be grounded.
- Be careful to heat.

- You need measurement of air concentration and ventilation in low, closed and confined areas due to lack of oxygen.

7.2 Conditions for safe storage, including any incompatibilities

- Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
- Store in a well-ventilated place. Keep container tightly closed.
- Store in a well-ventilated place. Keep cool.
- Empty drums should be completely drained, properly bunged, and promptly returned to a drum reconditioner, or properly disposed of.
- Keep away from food and drinking water.

8. Exposure controls/personal protection

8.1 Occupational Exposure limits

<1-chloro-2,3-epoxypropane>

- o **ACGIH regulation:** TWA = 0.5ppm
- o **Biological exposure index:** Not available
- o **OSHA regulation:** TWA=5ppm(19 mg/m³)(Final PELs), 2ppm(8mg/m³)(Vacated PELs)
- o **NIOSH regulation:** Not available
- o **EU regulation:**
 - Belgium: TWA=0.5ppm(2mg/m³)
 - Denmark: TWA=0.5ppm(1.9 mg/m³)
 - Czech republic: TWA=1mg/m³, Ceiling=2mg/m³
- o **Other:**
 - China: TWA=1mg/m³, STEL=2mg/m³
 - Argentina: TWA=0.5ppm [CMP]
 - Australia: TWA = 2ppm(7.6mg/m³)

<Hydrogen chloride>

- o **ACGIH regulation:** Ceiling=2ppm
- o **Biological exposure index:** Not available
- o **OSHA regulation:** Ceiling=5ppm
- o **NIOSH regulation:** Ceiling=5ppm
- o **EU regulation:**
 - Italy: TWA=5ppm
 - Ireland: TWA=5ppm
 - Malta: TWA=5ppm, STEL=10ppm
- o **Other:**
 - Singapore: STEL=5ppm
 - Sri Lanka: TWA= 5ppm
 - Vietnam: TWA=5mg/m³, STEL=7.5mg/m³

<Iron>

- o **ACGIH regulation:** Not available
- o **Biological exposure index:** Not available
- o **OSHA regulation:** Not available
- o **NIOSH regulation:** Not available
- o **EU regulation:**
 - Bulgaria: TWA=6mg/m³

(containing <2% free Crystalline silicon dioxide in respirable fraction, dust, inhalable fraction)

- Slovak republic: TWA=6mg/m³(total aerosol)

o Other:

- Indonesia: TWA=1mg/m³

- Russia: TWA=10mg/m³(aerosol)

8.2 Exposure controls

Appropriate engineering controls

- Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
- If user operations generate dust, fume, or mist, use ventilation to keep exposure to airborne contaminants below the recommended exposure limit.
- Facilities for storing or utilizing this material should be equipped with an eyewash facility and a safety shower.

Individual protection measures, such as personal protective equipment

Respiratory protection

- Follow the OSHA respirator regulations found in 29 CFR 1910.134. Use a NIOSH/MSHA approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Eye protection

- Wear chemical splash goggle.
- An eye wash unit and safety shower station should be available nearby work place.

Hand protection

- Wear appropriate chemical resistant protective gloves by considering physical and chemical properties of chemicals.

Body protection

- Wear appropriate chemical resistant protective clothing by considering physical and chemical properties of chemicals.

9. Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance

Description:	Liquid(20°C, 1,013hPa)
Color:	Colorless
Odor :	sweet, pungent or chloroform-like
Odor threshold :	10ppm
pH :	Not available
Melting point/freezing point :	-57°C
Initial boiling point and boiling range :	116~117°C(1atm)
Flash point :	31°C(closed-cup)
Evaporation rate :	Not available
Flammability (solid, gas) :	Flammable
Upper/lower flammability or explosive limits :	21/3.8%
Vapor pressure :	22.7hPa at 25°C

Vapor density :	Not available
Relative density	Not available
Solubility :	Very soluble(> 10,000 mg/L)
Partition coefficient: n-octanol/water :	0.45
Auto-ignition temperature :	385°C
Decomposition temperature	Not available
Viscosity :	1.073mPas(dynamic, 298.15K)

“NOTE: The physical data presented above are typical values and should not be construed as a specification”

10. Stability and reactivity

10.1 Reactivity/Chemical stability/Possibility of hazardous reactions:

- May decompose at high temperatures into forming toxic gases.
- May form explosive mixtures at temperatures at or above the flashpoint.
- May cause vapor explosion hazard indoors, outdoors or in sewers.
- Some of these materials may burn, but none ignite readily.
- Vapors may form explosive mixtures with air.
- Avoid contact with the temperature more than 325°C
- It may occur exothermic reaction, if it contact with water.
- It may form heat or foam by react with heat or acid/alkali material causing a polymerization.

10.2 Conditions to avoid:

- Keep away from heat/sparks/open flames/hot surfaces. No smoking.

10.3 Incompatible materials:

- Acid, metal, alcohol, phenol, organic acids, metal salts, amine, combustible materials, bases, oxidizing agents, halo carbons, aluminum, ammonia, magnesium, zinc, sodium

10.4 Hazardous decomposition products:

- Gas (chlorine, hydrogen chloride, carbon monoxide, carbon dioxide, phosgene), halogenated compounds, carbon oxides, irritating, corrosive and toxic vapors

11. Toxicological information

Information on toxicological effects	
(a) Acute toxicity	
Oral	Category 3
	- 1-chloro-2,3-epoxypropane: rat, LD ₅₀ = 175-282 mg/kg - Hydrogen chloride: rat, LD ₅₀ = 238-277 mg/kg - Iron: rat, LD ₅₀ = 98,600 mg/kg(OECD TG 401)
Dermal	Category 3
	- 1-chloro-2,3-epoxypropane: rabbit, LD ₅₀ = 250-500 mg/kg - Hydrogen chloride: rabbit, LD ₅₀ > 5,010 mg/kg - Iron: Not available

Inhalation	<p>Category 2</p> <ul style="list-style-type: none"> - 1-chloro-2,3-epoxypropane: rat, LD₅₀ = 4.10 mg/L/4hr - Hydrogen chloride: rat, LD₅₀ = 45.6 mg/L 39.5-52.8 mg/L/4hr - Iron: Rat, LC₅₀ > 0.3758mg/L/4hr
(b) Skin Corrosion/ Irritation	<p>Category 1</p> <ul style="list-style-type: none"> - 1-chloro-2,3-epoxypropane: In the test with rabbit, this substance was skin corrosion/irritation. - Hydrogen chloride: Hydrochloric acid aq. (1h, 4h) at 37% is corrosive to rabbit skin. (OECD TG 404) - Iron: In the test with rabbit, this substance was not skin corrosion/irritation. (OECD TG 404)
(c) Serious Eye Damage/ Irritation	<p>Category 1</p> <ul style="list-style-type: none"> - 1-chloro-2,3-epoxypropane: In the rabbit eye, 0.001 ml produced severe necrosis, while an excess of a 0.1% solution in water caused necrosis. - Hydrochloric acid: Hydrochloric acid may cause severe irritation with corneal injury that may result in permanent impairment of vision. (OECD TG 405) - Iron : In the test with rabbit, this substance was not eye damage/irritation.(OECD TG 405)
(d) Respiratory sensitization	Not available
(e) Skin Sensitization	<p>Category 1</p> <ul style="list-style-type: none"> - 1-chloro-2,3-epoxypropane: In the test with guinea pig, this substance was observed the skin sensitization. (OECD TG 406) - Hydrochloric acid: Both guinea pig maximization test (1% HCl in EtOH [undefined concentration] was used in both sensitization and challenge phase) and mouse ear swelling test (MEST; 1% HCl in 70% EtOH for sensitization phase, 5% HCl for challenge phase was used) showed negative results (Gad et al., 1986). - Iron: In the test with guinea pig, this substance was not observed the skin sensitization. (OECD TG 406)
(f) Carcinogenicity	<p>Category 1B</p> <ul style="list-style-type: none"> - 1-chloro-2,3-epoxypropane IARC: Group 2A(Probable Human Carcinogen) ACGIH: A3(Confirmed Animal Carcinogen with unknown Relevance to Humans) NTP: Reasonably Anticipated To Be A Human Carcinogen OSHA: Present EU CLP 1272/2008: Carc. 1B - Hydrogen chloride: IARC : Group 3 (Not classifiable as to carcinogenicity to human) ACGIH : A4 (Not classifiable as a human carcinogen)

	<p>- Iron: NTP: Present (excess or overload)</p>
(g) Mutagenicity	Not classified
	<p>- Hydrogen chloride <i>In vitro</i>: Mammalian cell gene mutation assay (<i>Mouse lymphoma L5178Y cells</i>) with/without metabolic activation: Positive <i>In vitro</i>: Mammalian chromosome aberration test (<i>Chinese hamster ovary</i>) with/without metabolic activation: Positive <i>In vitro</i>: Mitotic recombination in <i>Saccharomyces cerevisiae</i> (<i>Saccharomyces cerevisiae</i>) with/without metabolic activation: Negative <i>In vivo</i>: Not available</p> <p>- Iron <i>In vitro</i>: Mammalian cell gene mutation assay (<i>Mouse lymphoma L5178Y cells</i>) with metabolic activation: Positive (OECD TG 476) <i>In vitro</i>: Bacterial reverse mutation assay showed negative. (OECD TG 471)</p>
(h) Reproductive toxicity	Not classified
	<p>- 1-chloro-2,3-epoxypropane The prenatal development toxicity with rabbit, no evidence of maternal toxicity was evident in body weights, organ weights, or clinical observations at any exposure level (NOAEC > 25ppm) (OECD TG 414)</p> <p>- Hydrogen chloride Female rats were mated 12 days after a single exposure of hydrogen chloride vapour (302 ppm, 453 mg/m³) for 1 hour. Death from severe dyspnea and cyanosis occurred in one third of the dams, functional disorders of the lungs, the kidneys, the liver were observed in surviving dams and offspring, decreased bodyweight was observed in offspring (Pavlova, 1976).</p>
(i) Specific target organ toxicity (single exposure)	Not classified
	<p>- 1-chloro-2,3-epoxypropane In the test with rat, a group of three rats was exposed to a saturated atmosphere of epichlorohydrin for 6 minutes. One of the three rats died. Immediate severe irritation of the eyes was observed along with depressed activity and gasping.</p> <p>- Hydrogen chloride Mice were exposed for 10 minutes to concentrations ranging from 0.06 to 1.4mg/L, and dose-response curves were plotted, using the percentage decrease in respiratory rate for each exposure as the reaction reflecting sensory irritation of the upper respiratory tract.</p>
(j) Specific target organ toxicity (repeat exposure)	Not classified
	<p>- 1-chloro-2,3-epoxypropane In 90day sub-chronic oral study with rat, there were no significant adverse effects. Forestomach pathological effects noted at higher doses.</p>

	<p>(NOAEL = 1mg/kg/ bw/day) (OECD TG 408)</p> <p>- Hydrogen chloride Daily exposure of mice to gaseous hydrogen chloride at concentrations of 10, 20 and 50 ppm, 6 hours a day, 5 days per week up to a 90 day exposure period affected the body weight of mice of both sexes at the highest dose level. Clinical signs observed were mainly related to the irritant/corrosive properties of HCl as appendage injury (toes missing, swollen, open, gelatinous, scabbed, deformed), alopecia, lip(s) injury (missing, open, lesion, swollen, scabbed), crusty nose, mouth (jaw) injury (open, gelatinous, lesion, scabbed, swollen), poor coat quality, scabbed nose and nasal discharge in mice.</p> <p>- Iron In a subacute inhalation study with carbonyl iron, rats showed a clear inflammatory reaction in the lungs, as well as affected clearance, increased cell proliferation, hypertrophy and hyperplasia at 50 and 250 mg/m³.</p>
(k) Aspiration Hazard	Not available

12. Ecological information

12.1 Toxicity	
Acute toxicity	<p>Not classified</p> <p>- 1-chloro-2,3-epoxypropane Fish: 96hr LC₅₀(<i>Pimephales promelas</i>) = 12.7mg/L (ASTM Standard E 729-80, GLP) Crustacean: 48hr EC₅₀(<i>Daphnia magna</i>) = 23.9 mg/L (ASTM Standard E 729-80, GLP) Algae: 72hr EC₅₀(<i>Selenastrum capricornutum</i>) = 7.1 mg/L (OECD TG 210, GLP)</p> <p>- Hydrogen chloride Fish: 96hr LC₅₀(<i>Lepomis macrochirus</i>)=3.25-3.5mg/L 96hr LC₅₀(<i>Cyprinus carpio</i>)=4.3 mg/l (OECD TG 203) Crustacean: 48hr EC₅₀(<i>Daphnia magna</i>)=4.92mg/L (pH 5.3, OECG TG 202) Algae: 72hr EC₅₀(<i>Selenastrum capricornutum</i>)= 0.780mg/l(pH 5.1, biomass), 0.492mg/l(pH 5.3, growth rate) 72hr NOEC=0.097mg/l(pH 6.0, biomass, growth rate)(OECD TG 201)</p> <p>- Iron Fish: 96hr LC₀(<i>Danio rerio</i>) > 100,000 mg/L(OECD TG 203) Crustacean: 48hr LC₀(<i>Daphnia magna</i>) > 100 mg/L(OECD TG 202) Algae: Not available</p>
Chronic toxicity	Not classified
12.2 Persistence and degradability	<p>- 1-chloro-2,3-epoxypropane Persistence: Low persistency (log Kow is less than 4 estimated.) (Log Kow = 0.45) (Estimated) Degradability: Not available</p> <p>- Hydrogen chloride Persistence: Low persistency (log Kow is less than 4 estimated.)</p>

	(Log Kow = 0.54) (Estimated) Degradability: Not available
12.3 Bioaccumulative potential	- 1-chloro-2,3-epoxypropane Bioaccumulation: Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 3.162) (Estimated) Biodegradation: As well-biodegraded, it is expected to have low accumulation potential in living organisms (68% biodegradation was observed after 14 day)(OECD TG 301C) - Hydrogen chloride Bioaccumulation: Bioaccumulation is expected to be low according to the BCF < 500 (BCF = 3.162) (Estimated) Biodegradation: Not available
12.4 Mobility in soil	- 1-chloro-2,3-epoxypropane No potency of mobility to soil. (Koc = 9.907) (Estimated) - Hydrogen chloride No potency of mobility to soil. (Koc = 2.939) (Estimated)
12.5 Hazardous to the ozone layer	Not Classified
12.6 Other adverse effects	Not available

13. Disposal considerations

Disposal method

Waste must be disposed of in accordance with federal, state and local environmental control regulation.

Disposal precaution

Consider the required attentions in accordance with waste treatment management regulation.

14. Transport information

14.1 UN No.: 2023

14.2 UN Proper shipping name: EPICHLOROHYDRIN

14.3 Transport Hazard classes:

ADR: 6.1(3)

IMDG: 6.1(3)

ICAO/IATA: 6.1(3)

RID: 6.1(3)

14.4 Packing group: II

14.5 Environmental hazards: Applicable

14.6 Transport in bulk (according to Annex II of MARPOL 73/78 and the IBC Code): Not established

14.7 Special precautions for user

in case of fire: F-E

in case of leakage: S-D

15. Regulatory information**15.1 Safety, health and environmental regulation/legislation specific for the substance or mixture**

<1-chloro-2,3-epoxypropane>

USA Regulatory Information**TSCA (Toxic Substances Control Act):** Section 8(b) inventory: Present**Proposition 65:** Regulated**OSHA Regulation:** Not regulated**CERCLA Regulation:** 100 lb final RQ; 45.4 kg final RQ**SARA 302 Regulation:** 100 lb EPCRA RQ**SARA 304 Regulation:** Not regulated**SARA 313 Regulation:** Not regulated**SARA 311/312 Regulation:** Regulated**Foreign Regulatory Information****Substance of Roterdame Protocol:** Not regulated**Substance of Stockholme Protocol:** Not regulated**Substance of Montreal Protocol:** Not regulated**Foreign Inventory Status**

- Korea management information: Phase-in substance subject to registration (KE-05647), Toxic Chemical(97-1-192)
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (14880)
- Japan management information: Existing and New Chemical Substances (ENCS): Present ((3)-3266, (2)-947, (2)-275, (2)-1754)
- Canada management information: Domestic Substances List (DSL): Present (CEPA, subsection 81(3) applies)
- Australia management information: Australian Inventory of Chemical Substances (AICS): Present
- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): HSNO Approval: HSR000977
- Philippines management information: Philippine Inventory of Chemicals and Chemical Substances (PICCS): Present

< Hydrogen chloride >

USA Regulatory Information**TSCA (Toxic Substances Control Act):** Section 8(b) inventory(Present) [T]**Proposition 65:** Not regulated**OSHA Regulation:** 5,000 lb TQ; 5,000 lb TQ (anhydrous)**CERCLA Regulation:** 5,000 lb final RQ; 2,270 kg final RQ**SARA 302 Regulation:** 500 lb TP1 (gas only)**SARA 304 Regulation:** 5,000 lb EPCRA RQ (gas only)

SARA 313 Regulation: 1.0 % de minimis concentration (acid aerosols including mists, vapors, gas, fog, and other airborne forms of any particle size)

SARA 311/312 Regulation: Not regulated

Foreign Regulatory Information

Substance of Rotterdame Protocol: Not regulated

Substance of Stockholm Protocol: Not regulated

Substance of Montreal Protocol: Not regulated

Foreign Inventory Status

- Korea management information: Phase-in substance subject to registration (KE-20189),
Accident precaution chemicals,
Toxic Chemical(97-1-203)
- Japan management information: Existing and New Chemical Substances (ENCS): (1)-215
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (37053)
- Australia management information: Australian Inventory of Chemical Substances (AICS): Present
- Canada management information: Domestic Substances List (DSL): Present
- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): HSNO Approval:
HSR004090
- Philippines management information: Philippine Inventory of Chemicals and Chemical Substances
(PICCS): Present

<Iron>

USA Regulatory Information

TSCA (Toxic Substances Control Act): Section 8(b) inventory: Present

Proposition 65: Not regulated

OSHA Regulation: Not regulated

CERCLA Regulation: Not regulated

SARA 302 Regulation: Not regulated

SARA 304 Regulation: Not regulated

SARA 313 Regulation: Not regulated

SARA 311/312 Regulation: Not regulated

Foreign Regulatory Information

Substance of Rotterdame Protocol: Not regulated

Substance of Stockholm Protocol: Not regulated

Substance of Montreal Protocol: Not regulated

Foreign Inventory Status

- Korea management information: Existing Chemical Substance (KE-21059)
- China management information: Inventory of Existing Chemical Substances (IECSC): Present (34355)
- Canada management information: Domestic Substances List (DSL): Present
- Australia management information: Australian Inventory of Chemical Substances (AICS): Present

- New Zealand management information: New Zealand Inventory of Chemicals (NZIoC): May be used as a single component chemical under an appropriate group standard
- Philippines management information: Philippine Inventory of Chemicals and Chemical Substances (PICCS): Present

16. Other information, including date of preparation or last revision

16.1 Indication of changes:

Preparation date: March 8, 2018
Version: 5
Revision date: July 15, 2020

16.2 Key literature reference and sources for data:

- o National chemicals information systems; <http://ncis.nier.go.kr>
- o Pubchem; <http://pubchem.ncbi.nlm.nih.gov/>
- o AKRON; <http://ull.chemistry.uakron.edu/erd/>
- o IARC Monographs on the Evaluation of Carcinogenic Risks to Humans; <http://monographs.iarc.fr>
- o ECHA; <http://echa.europa.eu/web/guest>
- o HSDB; <http://toxnet.nlm.nih.gov/>
- o OECD SIDS; <http://webnet.oecd.org/>
- o NIOSH(The National Institute for Occupational Safety and Health)
- o ACGIH(American Conference of Governmental Industrial Hygienists)
- o TOMES-LOLI®; <http://www.rightanswerknowledge.com/loginRA.asp>
- o National Emergency Management Agency-Korea dangerous material inventory management system; <http://hazmat.mpss.kfi.or.kr/index.do>
- o Waste Control Act enforcement regulation attached [1]
- o EPISUITE Program ver.4.1

16.3 Abbreviations

ACGIH: American Conference of Governmental Industrial hygienists
NIOSH: The National Institute for Occupational Safety and Health
OSHA: Occupational Safety & Health Administration
IARC: International Agency for Research on Cancer
ADR: European Agreement concerning the International Carriage of Dangerous Goods by Road
IMDG: International Maritime Dangerous Goods
ICAO/IATA: International Civil Aviation Organization/ International Air Transport Association
RID: Regulations Concerning the International Transport of Dangerous Goods by Rail

16.4 Other

- Product should be handled, stored, and used in accordance with the generally accepted industrial hygiene practices and in conformity with all the applicable legal regulations.
- The information provided herein is based on the knowledge possessed at this present time from the view point of safety requirements.
- It should, therefore, not be construed as guaranteeing specific properties.