Emergency Telephone Numbers: (815) 424-2000 CHANNAHON PLANT (800) 424-9300 CHEMTREC

Product Name: HFO-1234ze

Revision Date: 12-Aug-2016

SECTION I  PRODUCT IDENTIFICATION / COMPANY INFORMATION

Cas Registry #: 29118-24-9
Chemical Family: Hydrofluoroolefin
Chemical Name: trans-1,3,3,3-Tetrafluoroprop-1-ene
Chemical Formula: C₃H₂F₄

SECTION II  COMPOSITION / DATA ON COMPONENTS

GHS Classification: Gases Under Pressure – Liquefied Gas, H280

GHS Label Elements
Symbol(s): ⚠️

Signal Words: Warning

GHS Hazard Statements:
Physical Hazards
H280: Contains gas under pressure; may explode if heated.
Gas may reduce oxygen in confined spaces.

Health Hazards

Environmental Hazards

Other Hazards
Rapid evaporation of the liquid may cause frostbite. Vapors are heavier than air and can cause suffocation by reducing available oxygen. May cause cardiac arrhythmia. Misuse or intentional inhalation can be fatal as a result of effects on the heart, without alarming symptoms.

GHS Precautionary Statements
Prevention:
Response:
Storage: P410+P403: Protect from sunlight. Store in a well-ventilated place.

SECTION III  COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>INGREDIENT</th>
<th>CAS No.</th>
<th>EINICS No.</th>
<th>TARGET (WT%)</th>
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<tbody>
<tr>
<td>trans-1,3,3,3-Tetrafluoroprop-1-ene</td>
<td>29118-24-9</td>
<td>471-480-0</td>
<td>100</td>
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</table>

SECTION IV  FIRST AID MEASURES

Emergency First Aid Procedures

Eye Contact: For liquid contact, irrigate with running water for minimum of 15 minutes. Seek medical attention.
Skin Contact: For liquid contact, warm areas gradually and get medical attention if there is evidence of frost bite or tissue damage. Flush area with lukewarm water. Do not rub affected area. If blistering occurs, apply a sterile dressing. Seek medical attention.
Inhalation: Remove to fresh air. Artificial respiration and/or oxygen may be necessary. Consult a physician.
Ingestion: This material is a gas under normal atmospheric conditions and ingestion is unlikely.
Most important symptoms and effects

**Acute**: Anesthetic effects at high concentrations.

**Delayed**: None known or anticipated. See Section 11 for information on effects from chronic exposure, if any.

**Notes to Physician**: Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in persons exposed to high concentrations (e.g., in enclosed spaces or with deliberate abuse). The use of other drugs with less arrhythmogenic potential should be considered. If sympathomimetic drugs are administered, observe for the development of cardiac arrhythmias.

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**SECTION V  FIRE FIGHTING MEASURES**

**Suitable Extinguishing Media:**
Use extinguishing measures that are appropriate to local circumstances and the surrounding environment. Water Mist, Dry Powder, Foam, Carbon Dioxide.

**Fire Fighting Procedures:**
Self-contained breathing apparatus (SCBA) is required if containers rupture and contents are released under fire conditions. Cool containers / tanks with water spray. Product is not combustible under normal conditions. However, this material can ignite when mixed with air under pressure and exposed to strong ignition sources. Do not allow run-off from fire fighting to enter drains or water courses. Vapours are heavier than air and can cause suffocation by reducing oxygen available for breathing. Some risk may be expected of corrosive and toxic decomposition products. Fire may cause evolution of: Hydrogen fluoride

**Unusual Fire and Explosion Hazards:**
If container is not properly cooled, it can rupture in the heat of a fire. Drains can be plugged and valves made inoperable by the formation of ice if rapid evaporation of large quantities of the liquefied gas occurs.

**Hazardous Combustion Products**: Hazardous decomposition products may include: Hydrogen Fluoride, Carbonyl fluoride. Carbon Oxides.

**NPCA - HMIS RATINGS**

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
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<tr>
<td>HEALTH</td>
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<tr>
<td>FLAMMABILITY</td>
<td>0</td>
</tr>
<tr>
<td>REACTIVITY</td>
<td>0</td>
</tr>
<tr>
<td>PERSONAL PROTECTION</td>
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</tbody>
</table>

(Personal Protection Information To Be Supplied By The User)

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**SECTION VI  ACCIDENTAL RELEASE MEASURES**

**Steps To Be Taken If Material Is Released or Spilled**
NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with cleanup. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

**Personal Precautions**: Evacuate personnel, thoroughly ventilate area, use self-contained breathing apparatus. Keep upwind of leak - evacuate until gas has dispersed.

**Environmental Precautions**: Stop spill/release if it can be done safely. Water spray may be useful in minimizing or dispersing vapors. If spill occurs on water notify appropriate authorities and advise shipping of any hazard.

**Methods for Containment and Clean-Up**: Ventilate area using forced ventilation, especially low or enclosed places where heavy vapors might collect. Notify relevant authorities in accordance with all applicable regulations.
Recommended measures are based on the most likely spillage scenarios for this material; however local conditions and regulations may influence or limit the choice of appropriate actions to be taken.

SECTION VII HANDLING AND STORAGE

Precautions for safe handling: Comply with state and local regulations. Avoid contact with skin, eyes and clothing. Avoid breathing vapors. Wash hands thoroughly after handling. Wash clothing after use. Decomposition will occur when product comes in contact with open flame or electrical heating elements. Use good personal hygiene practices and wear appropriate personal protective equipment (see section 8).

Contents are under pressure. Gases can accumulate in confined spaces and limit oxygen available for breathing. Use only with adequate ventilation. Do not enter confined spaces such as tanks or pits without following proper entry procedures such as ASTM D-4276 and 29CFR 1910.146.

Conditions for safe storage: Keep container(s) tightly closed and properly labeled. Use and store this material in cool, dry, well ventilated areas away from heat, direct sunlight. Store only in approved containers. Protect container(s) against physical damage. "Empty" containers retain residue and may be dangerous.

SECTION VIII EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Limits

<table>
<thead>
<tr>
<th>Component</th>
<th>ACIGH TLV (TWA)</th>
<th>ACIGH TLV (STEL)</th>
<th>OSHA PEL (TWA)</th>
<th>OTHER PEL</th>
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</thead>
<tbody>
<tr>
<td>trans-1,3,3,3-Tetrafluoroprop-1-ene</td>
<td></td>
<td></td>
<td>800 ppm Honeywell AEL</td>
<td></td>
</tr>
</tbody>
</table>

Engineering Controls: Use only with adequate ventilation. Keep container tightly closed.

Personal Protection:

Eye/Face Protection: The use of eye protection (such as splash goggles) that meets or exceeds ANSI Z.87.1 is recommended when there is potential liquid contact to the eye. Depending on conditions of use, a face shield may be necessary.

Skin Protection: Impervious, insulated gloves recommended.

Respiratory Protection: Wear NIOSH approved respiratory protection as appropriate.

Suggestions provided in this section for exposure control and specific types of protective equipment are based on readily available information. Users should consult with the specific manufacturer to confirm the performance of their protective equipment. Specific situations may require consultation with industrial hygiene, safety, or engineering professionals.

SECTION IX PHYSICAL AND CHEMICAL PROPERTIES

Appearance & Odor: Clear, colorless liquefied gas with a slight ethereal odor.

Odor Threshold: No Data

pH: Not Applicable

Melting / Freezing Point: No Data

Flash Point (Method): None per ASTM E681

Lower Explosion Limit: None < 28°C

Vapor Pressure @ 70 °F: 49 PSIG

Specific Gravity (H2O = 1.00): 1.19

Percent Volatile by Volume: 100%

Initial Boiling Point / Range: -19 °C

Evaporation Rate: > 1 (Ethyl Ether = 1.0)

Upper Explosion Limit: None < 28°C

Vapor Density (air = 1.00): 3.9

Solubility in Water @ 70 °F: 0.0373%

Auto-ignition temperature: 368 °C
SECTION X STABILITY AND REACTIVITY

Stability: Stable at normal temperatures and conditions
Hazardous Polymerization: Does not occur
Hazardous Decomposition Products: When pressurized with air or oxygen, the mixture may become flammable. Certain mixtures of HCFCs or HFCs with chlorine may become flammable or reactive under certain conditions. To avoid thermal decomposition, do not overheat.

SECTION XI TOXICOLOGICAL INFORMATION

Effects Of Over Exposure

Ingestion: Aspiration hazard!
Inhalation: Inhalation of vapor may produce anesthetic effects and feeling of euphoria. Prolonged overexposure can cause rapid breathing, headache, dizziness, narcosis, unconsciousness, and death from asphyxiation, depending on concentration and time of exposure.
Skin Contact: Contact with evaporating liquid can cause frostbite.
Eye Contact: Liquid can cause severe irritation, redness, tearing, blurred vision, and possible freeze burns.

Specific Target Organ Toxicity (Single Exposure): Not expected to cause organ effects from single exposure.
Specific Target Organ Toxicity (Repeated Exposure): Not expected to cause organ effects from repeated exposure.
Carcinogenicity: Not expected to cause cancer. This substance is not listed as a carcinogen by IARC, NTP or OSHA.
Germ Cell Mutagenicity: Not expected to cause heritable genetic effects.
Reproductive Toxicity: Not expected to cause reproductive toxicity.
Other Comments: High concentrations may reduce the amount of oxygen available for breathing, especially in confined spaces. Hypoxia (inadequate oxygen) during pregnancy may have adverse effects on the developing fetus.

Information on Toxicological Effects of Components
trans-1,3,3,3-Tetrafluoropro-1-ene

Acute inhalation toxicity:
Species: mouse
Note: Acute (4-Hour) Inhalation Toxicity Screening Study (mouse): No lethality at >100,000 ppm.
LC50: > 207000 ppm
Exposure time: 4 h
Species: rat

Skin irritation:
Species: rabbit
Result: No skin irritation
Method: OECD Test Guideline 404

Sensitisation:
Cardiac sensitization
Species: dogs
Result: Did not cause sensitisation on laboratory animals.

Repeated dose toxicity:
Species: rat
Application Route: Inhalation
Exposure time: 13 Weeks
Note: Causes mild effects on the heart. NOEL 5,000 ppm
Genotoxicity in vitro: Test Method: Chromosome aberration test in vitro
Cell type: Human lymphocytes
Result: negative

Genotoxicity in vivo: Test Method: Mutagenicity (in vivo mammalian bone-marrow cytogenetic test, chromosomal analysis)
Species: mouse
Cell type: Micronucleus
Application Route: Inhalation
Result: negative

Teratogenicity: Species: rabbit
Method: Prenatal Developmental Inhalation Toxicity Study
Note: Did not show teratogenic effects in animal experiments.

: Species: rat
Method: Prenatal Developmental Inhalation Toxicity Study
Note: Did not show teratogenic effects in animal experiments.

Further information: Note: Excessive exposure may cause central nervous system effects including drowsiness and dizziness. Excessive exposure may also cause cardiac arrhythmia. Rapid evaporation of the liquid may cause frostbite.

SECTION XII  ECOLOGICAL INFORMATION

Toxicity:

Ecotoxicity effects

Toxicity to fish: NOEC: > 117 mg/l
Exposure time: 96 h
Species: Cyprinus carpio (Carp)

Toxicity to daphnia and other aquatic invertebrates: EC50: > 160 mg/l
Exposure time: 48 h
Species: Daphnia magna (Water flea)

Toxicity to algae: Growth inhibition
NOEC: > 170 mg/l
Exposure time: 72 h
Species: Algae

Elimination information (persistence and degradability)

Biodegradability: aerobic
Result: Not readily biodegradable.

Additional ecological
Diversified CPC International, Incorporated
Safety Data Sheet

Information: no data available

Bioaccumulative Potential: Not expected as having the potential to bioaccumulate.

Mobility in Soil: Due to the extreme volatility of liquefied gases, air is the only environmental compartment in which they will be found.

Other Adverse Effects: None anticipated.

trans-1,3,3,3-Tetrafluoroprop-1-ene: GWP: 6

SECTION XIII DISPOSAL INFORMATION

Waste Disposal
Reclaim by distillation, incinerate, or remove to a permitted waste facility.

Environmental Hazards
Empty pressure vessels should be returned to the supplier.

** Comply With All State and Local Regulations **

SECTION XIV TRANSPORT INFORMATION

Transport Information
UN3163, Liquefied Gas, N.O.S., 2.2
(trans-1,3,3,3-Tetrafluoroprop-1-ene)

SECTION XV REGULATIONS

Regulatory Information

Chemical Inventories
USA TSCA: All components of this product are listed on the TSCA Inventory.

SARA Title III:
CERCLA/SARA (Section 302) Extremely Hazardous Substances and TPQs (in pounds):
This material does not contain any chemicals subject to the reporting requirements of SARA 302 and 40 CFR 372.

SARA (311, 312) Hazard Class:
Acute Health: Yes
Chronic Health: No
Fire Hazard: No
Pressure Hazard: Yes

SARA (313) Chemicals: Not listed

California Proposition 65: This material does not contain any chemicals which are known to the State of California to cause cancer, birth defects or other reproductive harm at concentrations that trigger the warning requirements of California Proposition 65.
SECTION XVI  OTHER INFORMATION

Watch for leaks and spills. Keep containers sealed and store in cool, well-ventilated area. Provide means to control leaks and spills. Do not mix with finely divided alkali or alkaline earth metals. Comply with all state and local regulations.

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as guidance for the safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.