1. PRODUCT AND COMPANY IDENTIFICATION

**Product Name**
XENON DIFLUORIDE

**Product Code(s)**
G-86, 1049

**UN-Number**
UN3085

**Recommended Use**
Etchant.

**Synonyms**
Xenon (II) Fluoride; Difluoroxenon

**Supplier Address**
Linde Gas North America LLC - Linde Merchant Production Inc. - Linde LLC
575 Mountain Ave.
Murray Hill, NJ 07974
Phone: 908-464-8100
www.lindeus.com

Linde Gas Puerto Rico, Inc.
Las Palmas Village
Road No. 869, Street No. 7
Catano, Puerto Rico 00962
Phone: 787-641-7445
www.pr.lindegas.com

Linde Canada Limited
5860 Chedworth Way
Mississauga, Ontario L5R 0A2
Phone: 905-501-1700
www.lindecanada.com

* May include subsidiaries or affiliate companies/ divisions.

For additional product information contact your local customer service.

**Chemical Emergency Phone Number**
Chemtrec: 1-800-424-9300 for US/ 703-527-3887 outside US

2. HAZARDS IDENTIFICATION

**DANGER!**

**Emergency Overview**

- Corrosive
- Oxidizer

The product causes burns of eyes, skin and mucous membranes

- Accelerates combustion and increases risk of fire.

<table>
<thead>
<tr>
<th>Appearance</th>
<th>Physical State</th>
<th>Odor</th>
</tr>
</thead>
<tbody>
<tr>
<td>White</td>
<td>Solid</td>
<td>Pungent</td>
</tr>
</tbody>
</table>

**OSHA Regulatory Status**
This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Potential Health Effects

Principle Routes of Exposure
Eye contact. Skin contact. Inhalation. Ingestion.

Acute Toxicity

Inhalation
Corrosive to respiratory system. Chemical pneumonitis and pulmonary edema result from exposure to the lower respiratory tract and deep lung. Residual pulmonary malfunction might occur.

Eyes
Corrosive to the eyes and may cause severe damage including blindness.

Skin
Contact causes severe skin irritation and possible burns. Symptoms may be delayed.

Skin Absorption Hazard
No known hazard by skin absorption.

Ingestion
Ingestion causes burns of the upper digestive and respiratory tract.

Chronic Effects
Extended low level systemic absorption of fluorides may cause fluorosis, an abnormal calcification pattern of the skeletal system.

Aggravated Medical Conditions
Skin disorders. Pre-existing eye disorders. Respiratory disorders.

Environmental Hazard
See Section 12 for additional Ecological Information.

3. COMPOSITION/ INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>CAS-No</th>
<th>Volume %</th>
<th>Chemical Formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xenon fluoride (XeF2)</td>
<td>13709-36-9</td>
<td>&gt;99</td>
<td>XeF₂</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General Advice
Immediate medical attention is required. Show this safety data sheet to the doctor in attendance.

Eye Contact
Immediate medical attention is required. In case of contact with substance, immediately flush eyes with running water for at least 30 minutes. Keep eye wide open while rinsing.

Skin Contact
Immediate medical attention is required. Wash off immediately with soap and plenty of water for at least 30 minutes while removing all contaminated clothing and shoes.

Inhalation
Move to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Call a physician immediately.

Ingestion
Immediate medical attention is required. Do not induce vomiting without medical advice. Never give anything by mouth to an unconscious person. Call a physician or Poison Control Center immediately.

Notes to Physician
For dermal exposure, the use of 2.5-33% calcium gluconate or carbonate gel or slurry has been recommended. The gel is either placed into a surgical glove into which the affected extremity is then placed or applied directly on the burn. This compound binds with the active fluorides in an insoluble form and limits burn extension and pain. Calcium chloride should not be used.

Protection of First-aiders
Use personal protective equipment. Avoid contact with skin, eyes and clothing.

5. FIRE-FIGHTING MEASURES

Flammable Properties
Oxidizer. May vigorously accelerate combustion.
Suitable Extinguishing Media
Use: Only Water.

Unsuitable Extinguishing Media
Do not use dry chemical, carbon dioxide, or halogenated extinguishing agents.

Hazardous Combustion Products
Decomposes into Xenon and Fluorine gas at temperatures >500°C.

Explosion Data
Sensitivity to Mechanical Impact
None

Sensitivity to Static Discharge
None

Specific Hazards Arising from the Chemical
This is a strong oxidizer and will react vigorously or explosively with many materials including fuels.

Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Additional chemical protective clothing may be required to protect from toxic decomposition products. Large Fires, flood with water. Apply water from protected location or from a safe distance.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions
Ensure adequate ventilation. Evacuate personnel to safe areas. Use personal protective equipment.

Environmental Precautions
Do not flush into surface water or sanitary sewer system. Should not be released into the environment.

Methods for Containment
Cover powder spill with plastic sheet or tarp to minimize spreading and keep powder dry.

Methods for Cleaning Up
Avoid dust formation. Take up mechanically and collect in suitable container for disposal.

Other Information
Refer to protective measures listed in Sections 7 and 8.

7. HANDLING AND STORAGE

Handling
This product is shipped in either PTFE bottles or steel cylinders. Glass materials are not recommended as storage medium. Use under vacuum transfer. Use only in ventilated areas.

Packaging to contain Xenon difluoride should be dry and free of hydrocarbons. Fluorine passivation may also be indicated.

Handle in accordance with good industrial hygiene and safety practice.

Storage
Protect from physical damage. Separate from water, combustibles and flammable materials. For further information on storage, handling, and use, see NFPA 430, Code for the Storage of Liquid and Solid Oxidizing Materials.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure Guidelines

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH TLV</th>
<th>OSHA PEL</th>
<th>NIOSH IDLH</th>
</tr>
</thead>
<tbody>
<tr>
<td>Xenon fluoride (XeF2) 13709-36-9</td>
<td>TWA: 2.5 mg/ m³ F</td>
<td>TWA: 2.5 mg/ m³ F</td>
<td>TWA: 2.5 mg/ m³ F</td>
</tr>
</tbody>
</table>
Other Exposure Guidelines: Vacated limits revoked by the Court of Appeals decision in AFL-CIO v. OSHA, 965 F.2d 962 (11th Cir., 1992).


Ventilation: Use under vacuum transfer.

Personal Protective Equipment:

Eye/Face Protection: Tightly fitting safety goggles. Face-shield.

Skin and Body Protection: Impervious gloves.

Respiratory Protection:

General Use: If exposure limits are exceeded or irritation is experienced, NIOSH/MSHA approved respiratory protection should be worn. Positive-pressure supplied air respirators may be required for high airborne contaminant concentrations. Respiratory protection must be provided in accordance with current local regulations.

Emergency Use: Use positive pressure air line respirator or self-contained breathing apparatus for exposure over exposure limits or emergency use. Emergency eye wash stations and drench showers should be in work area.

Hygiene Measures: Do not eat, drink or smoke when using this product. Remove and wash contaminated clothing before re-use. Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product. Regular cleaning of equipment, work area and clothing is recommended.

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>White</td>
</tr>
<tr>
<td>Odor Threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>Flash Point</td>
<td>No information available</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Freezing Point</td>
<td>60 °C / 140 °F</td>
</tr>
<tr>
<td>Water Solubility</td>
<td>25 g/ L @ 0 °C</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>0.073 PSIA @ 77°F</td>
</tr>
<tr>
<td>VOC Content (%)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent</td>
</tr>
<tr>
<td>Physical State</td>
<td>Solid</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Boiling Point/Boiling Range</td>
<td>114 °C / 237.2 °F</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>169.3</td>
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<tr>
<td>Evaporation Rate</td>
<td>No information available</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability Limits in Air</td>
<td></td>
</tr>
<tr>
<td>Upper</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Lower</td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

Note: Density: 4.32 kg/ l

10. STABILITY AND REACTIVITY

Stability: Stable - Will react with water or moisture in air to yield HF.


Conditions to Avoid: Heat, flames and sparks. Rapidly reacts with water or water vapor to form hydrofluoric acid which reacts with most metals and organic materials resulting in evolution of heat and hydrogen gas.

Hazardous Decomposition Products: Hydrogen fluoride.
Hazardous Polymerization

Hazardous polymerization does not occur.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity

LD50 Oral:
90 mg/kg (mouse)

LD50 Dermal: No information available.

LC50 Inhalation: 445 mg/m³; (mouse); (2 hr.)

Repeated Dose Toxicity No information available.

Chronic Toxicity

Chronic Toxicity Extended low level systemic absorption of fluorides may cause fluorosis, an abnormal calcification pattern of the skeletal system.

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>IARC</th>
<th>NTP</th>
<th>OSHA</th>
</tr>
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<tbody>
<tr>
<td>Xenon fluoride (XeF₂)</td>
<td></td>
<td>Group 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

IARC: (International Agency for Research on Cancer)
Group 3: Not Classifiable as to its Carcinogenicity to Humans

Irritation Corrosive to eyes Corrosive to skin

Sensitization No information available.

Reproductive Toxicity No information available.

Developmental Toxicity No information available.

Synergistic Materials None known.

Target Organ Effects Eyes. Skin. Respiratory system.

12. ECOLOGICAL INFORMATION

Ecotoxicity Harmful to aquatic organisms.

Ozone depletion potential; ODP; (R-11 = 1): Does not contain ozone depleting chemical (40 CFR Part 82).

13. DISPOSAL CONSIDERATIONS

Waste Disposal Methods Dispose of in accordance with federal, state, and local regulations
14. TRANSPORT INFORMATION

**DOT**

<table>
<thead>
<tr>
<th>Proper shipping name</th>
<th>Oxidizing solid, corrosive, n.o.s.*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Hazard Class</td>
<td>5.1</td>
</tr>
<tr>
<td>Subsidiary Class</td>
<td>8</td>
</tr>
<tr>
<td>UN-Number</td>
<td>UN3085</td>
</tr>
<tr>
<td>Packing Group</td>
<td>II</td>
</tr>
<tr>
<td>Description</td>
<td>UN3085, Oxidizing solid, corrosive, n.o.s.,(Xenon Difluoride), 5.1 (8), II</td>
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**TDG**

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**MEX**

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<td>UN-Number</td>
<td>UN3085</td>
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<tr>
<td>Packing Group</td>
<td>II</td>
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</tbody>
</table>

**IATA**

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<th>UN3085</th>
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<td>Hazard Class</td>
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<tr>
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<td>Packing Group</td>
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<tr>
<td>ERG Code</td>
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<td>Description</td>
<td>UN3085, Oxidizing solid, corrosive, n.o.s.,(Xenon Difluoride), 5.1 (8), II</td>
</tr>
<tr>
<td>Maximum Quantity for Passenger</td>
<td>5 kg</td>
</tr>
<tr>
<td>Maximum Quantity for Cargo Only</td>
<td>25 kg</td>
</tr>
<tr>
<td>Limited Quantity</td>
<td>2.5 kg</td>
</tr>
</tbody>
</table>

**IMDG/ IMO**

<table>
<thead>
<tr>
<th>Proper Shipping Name</th>
<th>Oxidizing solid, corrosive, n.o.s.*</th>
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<tr>
<td>Hazard Class</td>
<td>5.1</td>
</tr>
<tr>
<td>Subsidiary Class</td>
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</tr>
<tr>
<td>UN-Number</td>
<td>UN3085</td>
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<tr>
<td>Packing Group</td>
<td>II</td>
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<tr>
<td>EmS No.</td>
<td>F-A, S-Q</td>
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<tr>
<td>Description</td>
<td>UN3085, Oxidizing solid, corrosive, n.o.s., (Xenon Difluoride), 5.1 (8), II</td>
</tr>
</tbody>
</table>

**ADR**

Contaminated Packaging

Do not re-use empty containers. Return container to Linde or an authorized distributor.
Proper Shipping Name
Oxidizing solid, corrosive, n.o.s.*

Hazard Class
5.1

UN-Number
UN3085

Packing Group
II

Classification Code
OC2

Description
UN3085, Oxidizing solid, corrosive, n.o.s., (Xenon Difluoride), 5.1 (B), II, (E)

15. REGULATORY INFORMATION

International Inventories

TSCA
Complies

DSL
Does not Comply

NDSL
Complies

EINECS/ELINCS
Complies

Legend

TSCA - United States Toxic Substances Control Act Section 8(b) Inventory
DSL/ NDSL - Canadian Domestic Substances List/ Non-Domestic Substances List
EINECS / ELINCS - European Inventory of Existing Commercial Chemical Substances/ EU List of Notified Chemical Substances

U.S. Federal Regulations

SARA 313
Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 (SARA). This product does not contain any chemicals which are subject to the reporting requirements of the Act and Title 40 of the Code of Federal Regulations, Part 372.

SARA 311/312 Hazard Categories

Acute Health Hazard
Yes

Chronic Health Hazard
Yes

Fire Hazard
Yes

Sudden Release of Pressure Hazard
No

Reactive Hazard
Yes

Clean Water Act
This product does not contain any substances regulated as pollutants pursuant to the Clean Water Act (40 CFR 122.21 and 40 CFR 122.42).

Risk and Process Safety Management Programs
This material, as supplied, does not contain any regulated substances with specified thresholds under 40 CFR Part 68. This product does not contain any substances regulated as Highly Hazardous Chemicals pursuant to the 29 CFR Part 1910.110.

Clean Air Act, Section 112
This product does not contain any substances regulated as hazardous air pollutants (HAPS) under Section 112 of the Clean Air Act Amendments of 1990.

CERCLA/ SARA
This material, as supplied, does not contain any substances regulated as hazardous substances under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302) or the Superfund Amendments and Reauthorization Act (SARA) (40 CFR 355). There may be specific reporting requirements at the local, regional, or state level pertaining to releases of this material.
U.S. State Regulations

California Proposition 65
This product does not contain any Proposition 65 chemicals.

U.S. State Right-to-Know Regulations

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Massachusetts</th>
<th>New Jersey</th>
<th>Pennsylvania</th>
<th>Illinois</th>
<th>Rhode Island</th>
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</thead>
<tbody>
<tr>
<td>Xenon fluoride (XeF2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

International Regulations

Canada

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all the information required by the CPR.

WHMIS Hazard Class
C  Oxidizing materials
E  Corrosive material
F  Dangerously reactive material
Prepared By
Product Stewardship
23 British American Blvd.
Latham, NY 12110
1-800-572-6501

Issuing Date
14-Feb-2011

Revision Date
05-Jun-2013

Revision Number
1

Revision Note
(M)SDS sections updated: 5, 7, 8, 9, 11, 14.

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Stability</th>
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</thead>
<tbody>
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<td>0</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>HMIS</th>
<th>Health Hazard</th>
<th>Flammability</th>
<th>Physical Hazard</th>
<th>Personal Protection</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>3*</td>
<td>0</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Note: Ratings were assigned in accordance with Compressed Gas Association (CGA) guidelines as published in CGA Pamphlet P-19-2009, CGA Recommended Hazard Ratings for Compressed Gases, 3rd Edition.

General Disclaimer
For terms and conditions, including limitation of liability, please refer to the purchase agreement in effect between Linde LLC, Linde Merchant Production, Inc. or Linde Gas North America LLC (or any of their affiliates and subsidiaries) and the purchaser.

DISCLAIMER OF EXPRESSED AND IMPLIED WARRANTIES
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End of Safety Data Sheet