

Section 1. Chemical product and company identification

| | |
|-------------------------------------|--|
| Product name | : Fluorine |
| Supplier | : AIRGAS INC., on behalf of its subsidiaries 259 North Radnor-Chester Road Suite 100 Radnor, PA 19087-5283 1-610-687-5253 |
| Product use | : Synthetic/Analytical chemistry. |
| Synonym | : F2; Bifluoriden; Fluor; Fluorine, compressed; Fluoro; Fluorures acide; Fluoruri acidj; Rcra waste number P056; Saeure fluoride; UN 1045 |
| MSDS # | : 001061 |
| Date of Preparation/Revision | : 3/20/2008. |
| In case of emergency | : 1-866-734-3438 |

Section 2. Hazards identification

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|---|--|
| Physical state | : Gas. [PALE YELLOW GAS WITH A PUNGENT, IRRITATING ODOR] |
| Emergency overview | : DANGER! OXIDIZER. MAY BE FATAL IF INHALED. CAUSES SEVERE RESPIRATORY TRACT, EYE AND SKIN BURNS. CAN CAUSE TARGET ORGAN DAMAGE. CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE. CONTENTS UNDER PRESSURE. Do not puncture or incinerate container. Do not breathe gas. Do not get on skin or clothing. Can cause target organ damage. Use only with adequate ventilation. Keep container closed. Do not get in eyes, on skin or on clothing. Avoid breathing gas. Wash thoroughly after handling. Store in tightly-closed container. Avoid contact with combustible materials. Contact with rapidly expanding gases can cause frostbite. |
| Target organs | : Causes damage to the following organs: eyes. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eye, lens or cornea. |
| Routes of entry | : Inhalation Dermal Eyes |
| Potential acute health effects | |
| Eyes | : Severely corrosive to the eyes. Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite. |
| Skin | : Severely corrosive to the skin. Causes severe burns. Contact with rapidly expanding gas may cause burns or frostbite. |
| Inhalation | : Very toxic by inhalation. Severely corrosive to the respiratory system. |
| Ingestion | : Ingestion is not a normal route of exposure for gases |
| Potential chronic health effects | : CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. |
| Medical conditions aggravated by over-exposure | : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product. |

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

| Name | CAS number | % Volume | Exposure limits |
|----------|------------|----------|---|
| Fluorine | 7782-41-4 | 100 | ACGIH TLV (United States, 1/2007). STEL: 3.1 mg/m ³ 15 minute(s). TWA: 1.6 mg/m ³ 8 hour(s). NIOSH REL (United States, 12/2001). TWA: 0.2 mg/m ³ 10 hour(s). OSHA PEL (United States, 11/2006). TWA: 0.2 mg/m ³ 8 hour(s). |

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Frostbite** : Try to warm up the frozen tissues and seek medical attention.
- Inhalation** : Call medical doctor or poison control center immediately. Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : As this product is a gas, refer to the inhalation section.

Section 5. Fire fighting measures

- Flammability of the product** : Non-flammable.
- Products of combustion** : Decomposition products may include the following materials: halogenated compounds
- Fire hazards in the presence of various substances** : Extremely flammable in the presence of the following materials or conditions: reducing materials, combustible materials and organic materials.
- Fire-fighting media and instructions** : Use an extinguishing agent suitable for the surrounding fire.

Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Contact with combustible material may cause fire. This material increases the risk of fire and may aid combustion. In a fire or if heated, a pressure increase will occur and the container may burst or explode.
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

- Personal precautions** : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Eliminate all ignition sources if safe to do so. Do not touch or walk through spilled material. Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.
- Methods for cleaning up** : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

- Handling** : Use only with adequate ventilation. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not get in eyes, on skin or on clothing. Keep container closed. Do not get on skin or clothing. Store in tightly-closed container. Avoid contact with combustible materials. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.
- Storage** : Keep container tightly closed. Keep container in a cool, well-ventilated area. Separate from acids, alkalis, reducing agents and combustibles. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

- Engineering controls** : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Personal protection

- Eyes** : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts.
- Skin** : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.
- Respiratory** : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
- Hands** : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.
- Personal protection in case of a large spill** : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product. Full chemical-resistant suit and self-contained breathing apparatus should be worn only by trained and authorized persons.

Product name

fluorine

ACGIH TLV (United States, 1/2007).

STEL: 3.1 mg/m³ 15 minute(s).

TWA: 1.6 mg/m³ 8 hour(s).

NIOSH REL (United States, 12/2001).

TWA: 0.2 mg/m³ 10 hour(s).

OSHA PEL (United States, 11/2006).

TWA: 0.2 mg/m³ 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

- Molecular weight** : 38 g/mole
- Molecular formula** : F₂
- Boiling/condensation point** : -187°C (-304.6°F)
- Melting/freezing point** : -219.4°C (-362.9°F)
- Critical temperature** : -128.5°C (-199.3°F)
- Vapor density** : 1.7 (Air = 1)
- Specific Volume (ft³/lb)** : 10.20
- Gas Density (lb/ft³)** : 0.098

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Section 10. Stability and reactivity

- Stability and reactivity** : The product is stable.
- Incompatibility with various substances** : Extremely reactive or incompatible with the following materials: reducing materials, combustible materials, organic materials, metals, alkalis and moisture.
- Hazardous decomposition products** : Under normal conditions of storage and use, hazardous decomposition products should not be produced.
- Hazardous polymerization** : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

| Product/ingredient name | Result | Species | Dose | Exposure |
|-------------------------|----------------------|---------|---------|----------|
| fluorine | LC50 Inhalation Gas. | Rat | 185 ppm | 1 hours |
| | LC50 Inhalation Gas. | Mouse | 150 ppm | 1 hours |

- IDLH** : 25 ppm
- Chronic effects on humans** : Causes damage to the following organs: eyes. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eye, lens or cornea.
- Other toxic effects on humans** : Extremely hazardous by the following route of exposure: of skin contact (corrosive), of eye contact (corrosive), of inhalation (lung corrosive).

Specific effects

- Carcinogenic effects** : No known significant effects or critical hazards.
- Mutagenic effects** : No known significant effects or critical hazards.
- Reproduction toxicity** : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity


Not available.

- Environmental fate** : Not available.
- Environmental hazards** : No known significant effects or critical hazards.
- Toxicity to the environment** : Not available.







Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.

Section 14. Transport information

| Regulatory information | UN number | Proper shipping name | Class | Packing group | Label | Additional information |
|---------------------------|-----------|----------------------|-------|-----------------------|---|---|
| DOT Classification | UN1045 | FLUORINE, COMPRESSED | 2.3 | Not applicable (gas). |  | Reportable quantity 10 lbs. (4.54 kg) Limited quantity Yes. Packaging instruction Passenger aircraft Quantity |

Fluorine

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|------------------------------|--------|-------------------------|-----|-----------------------|---|--|
| | | | | | | limitation: Forbidden. Cargo aircraft Quantity limitation: Forbidden. Special provisions 1 |
| TDG Classification | UN1045 | FLUORINE, COMPRESSED | 2.3 | Not applicable (gas). |    | Explosive Limit and Limited Quantity Index 0 ERAP Index 25 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden Special provisions 38 |
| Mexico Classification | UN1045 | FLUORINE, COMPRESSED | 2.3 | Not applicable (gas). |    | - |

Section 15. Regulatory information

United States

- U.S. Federal regulations** : **United States inventory (TSCA 8b)**: This material is listed or exempted.
- SARA 302/304/311/312 extremely hazardous substances**: fluorine
- SARA 302/304 emergency planning and notification**: fluorine
- SARA 302/304/311/312 hazardous chemicals**: fluorine
- SARA 311/312 MSDS distribution - chemical inventory - hazard identification**: fluorine: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard
- Clean Water Act (CWA) 307**: No products were found.

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Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: fluorine

Clean Air Act (CAA) 112 regulated flammable substances: No products were found.

Clean Air Act (CAA) 112 regulated toxic substances: fluorine

SARA 313

| | <u>Product name</u> | <u>CAS number</u> | <u>Concentration</u> |
|--|---------------------|-------------------|----------------------|
| Form R - Reporting requirements | : Fluorine | 7782-41-4 | 100 |
| Supplier notification | : Fluorine | 7782-41-4 | 100 |

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations :

Canada

WHMIS (Canada) : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material
Class F: Dangerously reactive material.

Section 16. Other information

United States

Label requirements : OXIDIZER.
MAY BE FATAL IF INHALED.
CAUSES SEVERE RESPIRATORY TRACT, EYE AND SKIN BURNS.
CAN CAUSE TARGET ORGAN DAMAGE.
CONTACT WITH COMBUSTIBLE MATERIAL MAY CAUSE FIRE.
CONTENTS UNDER PRESSURE.

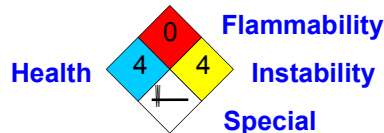
Canada

Label requirements : Class A: Compressed gas.
Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
Class E: Corrosive material
Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.) :

| | | |
|-------------------------|---|---|
| Health | * | 4 |
| Flammability | | 0 |
| Physical hazards | | 4 |
| | | |

National Fire Protection Association (U.S.A.) :



Notice to reader

Fluorine

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.