

MATERIAL SAFETY DATA SHEET

North American Version

Ammonium Bifluoride

1. PRODUCT AND COMPANY IDENTIFICATION

1.1. Identification of the substance/preparation

Product Name : Ammonium Bifluoride
Chemical Name : Ammonium hydrogendifluoride
Synonyms : Ammonium hydrogen fluoride, Ammonium acid fluoride, ABF
Chemical Formula : $\text{NH}_4\text{F}\cdot\text{HF}$
Molecular Weight : 57
CAS Number : 1341-49-7
Grades/Trade Names : None

1.2. Use of the Substance/Preparation

Recommended use : Etching agent; cleaning/washing agents and disinfectants; metal treatment, oil & gas industry; chemical intermediates

1.3. Company/Undertaking Identification

Address : Solvay Fluorides, LLC
PO BOX 27328 Houston, TX 77227-7328
3333 Richmond Ave. Houston, Texas 77098

1.4. Emergency telephone numbers

General: 1-877-765-8292 (Solvay Chemicals, Inc.)

Emergencies (USA): 1-800-424-9300 (CHEMTREC®)

Transportation Emergencies (INTERNATIONAL/MARITIME): 1-703-527-3887 (CHEMTREC®)

Transportation Emergencies (CANADA): 1-613-996-6666 (CANUTEC)

Transportation Emergencies (MEXICO-SETIQ): 01-800-00-214-00 (MEX. REPUBLIC)
525-559-1588 (Mexico City and metro area)

2. HAZARDS IDENTIFICATION

2.1. Emergency Overview:

General Information

Appearance : flakes, very hygroscopic
Color : white
Odor : pungent

Main effects

- Corrosive product, hazardous to human health.
- Presents hazards from its ionizing fluorine.
- Hazardous product for the aquatic environment.
- In case of decomposition, releases hydrogen fluoride.

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Main symptoms

- Product causes burns of mucous membranes, eye and skin.
- Risk of cardiac and nervous disorders.
- The seriousness of the lesions and the prognosis of intoxication depend directly on the concentration and duration of exposure.
- Chronic exposure (to the Product) at high concentrations can cause bone fluorosis.

Inhalation

- Severe respiratory irritant.
- Spasmodic cough and difficulty in breathing.
- At high concentrations, risk of chemical pneumonitis, pulmonary (o)edema.
- At high concentrations, risk of hypocalcemia with nervous problems (tetany) and cardiac arrhythmia.
- In case of repeated or prolonged exposure: risk of sore throat, nose bleeds, chronic bronchitis.

Eye contact

- Severe eye irritation, watering, redness and swelling of the eyelids.
- Burns
- Risk of serious or permanent eye lesions.
- Risk of blindness.

Skin contact

- Painful irritation, delayed appearance.
- Risk of severe burns; slow healing.
- Risk of shock.
- If touched using the fingernails, severe pain after several hours.
- Risk of hypocalcemia following the extent of the lesions.

Ingestion

- If ingested, severe burns of the mouth and throat as well as danger of perforation of the (o) esophagus and stomach.
- Risk of throat (o)edema and suffocation.
- Nausea, vomiting (bloody), abdominal cramps and diarrhea (bloody).
- Cough and difficulty breathing.
- Risk of hypocalcemia with nervous disorders (tetany) and cardiac rhythm disorders.
- Risk of convulsions, loss of consciousness, deep coma and cardiopulmonary arrest.
- Risk of general symptoms having a severe prognosis.

Other toxicity effects

See section 11: Toxicological Information

2.3. Environmental Effects:

See section 12: Ecological Information

3. COMPOSITION OF/INFORMATION ON INGREDIENTS

Ammonium bifluoride

CAS-No. : 1341-49-7
Concentration : > 94.00 %

Ammonium fluoride

CAS-No. : 12125-01-8
Concentration : ca. 4.00 %

4. FIRST AID MEASURES

4.1. Inhalation

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- In case of accident by inhalation: remove casualty to fresh air and keep at rest.
- Oxygen or cardiopulmonary resuscitation if necessary.
- Victim to lie down in the recovery position, cover and keep him warm.
- Consult a physician.
- Take victim immediately to hospital.

4.2. Eye contact

- Consult with an ophthalmologist immediately in all cases.
- Take victim immediately to hospital.
- Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
- Rinse the eyes with a calcium gluconate 1% solution in physiological serum (10 ml of calcium gluconate 10% in 90 ml of physiological serum)
- In the case of difficulty of opening the lids, administer an analgesic eye wash (oxybuprocaine).

4.3. Skin contact

- Remove contaminated shoes, socks and clothing, under the shower if necessary; wash the affected skin with running water.
- Immediately apply calcium gluconate gel 2.5% and massage into the affected area using rubber gloves; continue to massage while repeatedly applying gel until 15 minutes after pain is relieved (See section 16).
- If fingers/finger nails are touched, even if there is no pain, dip them in a bath of 5% calcium gluconate for 15 to 20 minutes.
- Keep warm (blanket), provide clean clothing.
- Consult a physician in all cases.

4.4. Ingestion

The following actions are recommended :

- Call a physician immediately in all cases.
- Take to hospital immediately.

If victim is conscious:

- Rinse mouth with fresh water.
- Give to drink a 1% aqueous calcium gluconate solution.
- Do NOT induce vomiting.
- If the subject presents nervous, respiratory or cardiovascular disorders: administer oxygen.

If victim is unconscious but breathing:

- Artificial respiration and/or oxygen may be necessary.

5. FIRE-FIGHTING MEASURES

5.1. Suitable extinguishing media

- Use extinguishing measures that are appropriate to local circumstances and the surrounding environment.

5.2. Extinguishing media which must not be used for safety reasons

- Never use water.

5.3. Special exposure hazards in a fire

- Non-combustible/non-flammable but may produce dangerous fumes if involved in fire.
- Hazardous decomposition products
- Contact with water liberates hazardous gas.
- Formation of flammable gas on contact with certain metals (see section 10).

5.4. Special protective equipment for fire-fighters

- Evacuate personnel to safe areas.
- Intervention only by capable personnel who are trained and aware of the hazards of the product.
- In the event of fire, wear self-contained breathing apparatus.

- When intervention in close proximity wear acid resistant over suit.
- Protect intervention team with a water spray as they approach the fire.
- Clean contaminated surface thoroughly.

5.5. Other information

- Keep product and empty container away from heat and sources of ignition.
- Keep away from water.
- Approach from upwind.
- Suppress (knock down) gases/vapors/mists with a water spray jet.
- After the fire, proceed rapidly to clean the surfaces exposed to the fumes in order to limit the damage to the equipment.
- As for any fire, ventilate and clean the rooms before re-entry.
- Depending on wind direction, warn people of the danger of intoxication, close doors and windows, and switch off the ventilation.

6. ACCIDENTAL RELEASE MEASURES

6.1. Personal precautions

- Refer to protective measures listed in sections 7 and 8.
- Keep away from incompatible products.
- Avoid dust formation.
- Ventilate the area.

6.2. Environmental precautions

- Immediately notify the appropriate authorities in case of significant discharge.
- Do not discharge into the environment (sewers, rivers, soils, etc.).

6.3. Methods for cleaning up

- Pick up and arrange disposal without creating dust.
- Place everything into a closed, labeled container compatible with the product.
- Treat recovered material as described in the section "Disposal considerations" (See section 13).
- Clean the area with large quantities of water.

7. HANDLING AND STORAGE

7.1. Handling

- Use in closed system.
- Handle small quantities under a lab hood.
- Use only in well-ventilated areas.
- Keep away from heat.
- Keep away from incompatible products

7.2. Storage

- Keep in a dry place.
- Keep in a cool, well-ventilated place.
- Keep away from heat.
- Keep away from incompatible products
- Keep in original packaging, closed.

7.2. Packaging material

- Paper + PE.

7.3. Other information

- Avoid dust formation.
- Warn people about the dangers of the product.
- Refer to protective measures listed in sections 7 and 8.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

8.1 Exposure Limit Values	TLV® ACGIH® USA	OSHA PEL
Fluorides	2.5 mg/m ³ (as F) 2.3 mg/ m ³ -ceiling (as F)	2.5 mg/ m ³ (as F) 2.3 mg/ m ³ -ceiling (as F)

ACGIH® and TLV® are registered trademarks of the American Conference of Governmental Industrial Hygienists.

8.2. Engineering controls

- Ensure adequate ventilation.
- Provide local ventilation appropriate to the product decomposition risk (see section 10).
- Provide appropriate exhaust ventilation at places where dust is formed.
- Apply technical measures to comply with the occupational exposure limits.

8.3. Personal protective equipment

8.3.1. Respiratory protection

- In case of emissions and dust clouds/fog/fumes, face mask with appropriate cartridge.
- Self-contained breathing apparatus in medium confinement/insufficient oxygen/in case of large uncontrolled emissions/in all circumstances when the mask and cartridge do not give adequate protection.
- Use only respiratory protection that conforms to international/ national standards.
- Use NIOSH approved respiratory protection.
- Comply with OSHA respiratory protection requirements.

8.3.2. Hand protection

- Wear suitable gloves.
- Recommended materials: Butyl rubber

8.3.3. Eye protection

- Chemical resistant goggles must be worn.

8.3.4. Skin and body protection

- Acid resistant clothing.
- Apron/boots of butyl rubber if risk of splashing.

8.3.5. Hygiene measures

- Shower and eye wash stations
- Contaminated equipment (brushes, rags) must be cleaned immediately with water.
- Take off contaminated clothing immediately after work.
- Prohibit contact with any leather object
- Handle in accordance with good industrial hygiene and safety practice.
- High standards of skin care and personal hygiene should be exercised at all times.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1. General Information

Appearance	:	flakes, very hygroscopic
Color	:	white
Odor	:	pungent

9.2. Important Health Safety and Environmental Information

pH	:	2
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Concentration: 5.7 g/l
Temperature: 20°C (68°F)

Boiling point/range	:	230°C (446°F) <i>Remarks: Decomposition</i>
Flash point	:	<i>Remarks: Not applicable</i>
Flammability	:	<u>Lower explosion limit:</u> <i>Remarks: Not applicable</i>
Explosive properties	:	<i>Remarks: no data available</i>
Oxidizing properties	:	Not applicable
Vapor pressure	:	Not applicable
Relative density / Density	:	1.5
Partition coefficient (n-octanol/water)	:	<i>Remarks: Not applicable</i>
Viscosity	:	Not applicable
Vapor density	:	Not applicable
Bulk Density	:	700 kg/m ³
Solubility	:	Water : 630 g/l Temperature: 20°C (68°F)

9.3 Other information

Melting point/range	:	126°C (259°F)
Decomposition temperature	:	>= 230°C (446°F)

10. STABILITY AND REACTIVITY

10.1. Stability

- Corrosive action on some metals with moisture.
- In presence of humidity, contact with metals releases hydrogen.

10.2. Conditions to avoid

- To avoid thermal decomposition, do not overheat.
- Exposure to moisture.

10.3. Materials to avoid

- Strong acids
- Strong bases
- Silicate containing materials (glass, cement,...).
- Metals

10.4. Hazardous decomposition products

- Hydrogen fluoride
- Ammonia
- Nitrogen oxides (NOx)

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11. TOXICOLOGICAL INFORMATION

Toxicological data

Acute oral toxicity

- LD50, rat, from 60 - 130 mg/kg

Irritation (other route)

- Reacts with mucous membranes

Chronic toxicity

- Oral, Prolonged exposure, rat/mouse, Target Organs: skeleton, thyroid gland, testes, liver, NOEL: ca. 1 mg/kg, observed effect

Carcinogenicity

- Ambiguous carcinogenic effect, (Sodium fluoride)

Teratogenicity

- Foetotoxic and fertility effects, (Sodium fluoride)

Remarks

- Toxic effect linked with corrosive properties
- Chronic exposure may entail dental or skeletal fluorosis
- The carcinogenic effect found in animals is not demonstrated in human
- Risk of toxic effect on reproduction
- Ambiguous mutagenic effect, (Sodium fluoride)

12. ECOLOGICAL INFORMATION

- Remarks: 10 mg NH₄F·HF/l: pH = 3.38; 100 mg NH₄F·HF/l: pH = 2.88

12.1. Ecotoxicity effects

Acute toxicity

- Fishes, Brachydanio rerio, LC50, 96 h, from 237 - 562 mg/l
- Fishes, Salmo gairdneri, LC50, 96 h, 51 mg/l (Fluorides)
- Remarks: 10 mg NH₄F·HF/l: pH = 3.38; 100 mg NH₄F·HF/l: pH = 2.88
- Crustaceans, Daphnia magna, EC50, 48 h, 97 mg/l (Fluorides)
Remarks: fresh water
- Crustaceans, Mysidopsis bahia, EC50, 96 h, 10.5 mg/l (Fluorides)
Remarks: salt water

Chronic toxicity

- Fishes, Salmo gairdneri, LC50, 21 Days, from 2.7 - 4.7 mg/l (Fluorides)
- Remarks: no specific data
- Crustaceans, Daphnia magna, NOEC, 21 Days, 3.7 mg/l (Fluorides)
- Algae, Scenedesmus sp., EC50, 96 h, 43 mg/l (Fluorides)

Further information on ecology

- Bacteria, various species, LOEC, 1,317 mg/l
Remarks: biological treatment sludge

12.2. Mobility

- Air
Remarks: mobile in aerosol form
- Water/soil
Remarks: considerable solubility and mobility
- Soil/sediments, (Ammonia)
Remarks: considerable adsorption

- Soil/sediments, (Fluorides)
Conditions: slightly acid pH
Remarks: adsorption on mineral soil constituents

Abiotic degradation

- Water/soil (Fluorides)
Result: complexation/precipitation of inorganic materials
Degradation products: aluminum/iron/calcium/phosphate complexes and/or precipitates as a function of pH
- Water/soil
Result: hydrolysis as a function of pH
Degradation products: ammonia / hydrofluoric acid/fluoride

Biodegradation

- aerobic, Tested according to: oxidation (Ammonia)
Degradation products: nitrate
- Remarks: The methods for determining biodegradability are not applicable to inorganic substances.

12.4. Bioaccumulative potential

- Bioconcentration: log Pow
Result: not applicable (ionizable inorganic compound)
- (Gaseous ammonia/fluorides)
Result: accumulation into vegetable leaves
- (Ammonia)
Result: assimilation and consumption in proteic synthesis

12.5. Other adverse effects

- No data

12.6. Remarks

- Harmful for aquatic organisms due to acid pH.
- Product fate is highly depending on environmental conditions: pH, temperature, oxidoreductive potential, mineral and organic content of the medium,...

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment: Ammonium Bifluoride is not a listed hazardous waste under 40 CFR 261. However, state and local regulations for waste disposal may be more restrictive. Spilled product should be disposed of in an EPA approved disposal facility in accordance with applicable national, state and local environmental laws and regulations.

13.2 Packaging treatment: To avoid treatments, use dedicated containers where possible. Rinse the empty containers and treat the effluent in the same way as waste. Consult current federal, state and local regulations regarding the proper disposal of emptied containers.

13.3 RCRA Hazardous Waste: D002 (Corrosivity)

14. TRANSPORT INFORMATION

Mode	DOT	IMDG	IATA
UN Number	UN 1727	UN 1727	UN 1727
Class (Subsidiary)	8	8	8
Proper	Ammonium	Ammonium	Ammonium

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Shipping Name	hydrogendifluoride, solid	hydrogendifluoride, solid	hydrogendifluoride, solid
Hazard Label	8	Corrosive	Corrosive
Placard	Corrosive	1727	1727
Packing Group	II	II	II
Emergency Info	ERG: 154	EmS: F-A, S-B	ERG Code: 8L

15. REGULATORY INFORMATION

National Regulations (US)

TSCA Inventory 8(b): Yes

SARA Title III Sec. 302/303 Extremely Hazardous Substances (40 CFR355): No

SARA Title III Sec. 311/312 (40 CFR 370):

Hazard Category:

- Acute Health Hazard
- Threshold planning quantity – 10,000 lbs.

SARA Title III Sec. 313 Toxic Chemical Emissions Reporting (40 CFR 372): No

CERCLA Hazardous Substance (40CFR Part 302):

Listed: Yes, RQ 100 lbs.
Unlisted Substance: D002 (Corrosivity)

State Component Listing:

State	List
CA	Airborne Contaminants & Emissions Inventory
CA	Hazardous Substance List
CT	Hazardous Material Survey
IL	Chemical Safety Act
IL	Toxic Substances Disclosure to Employees Act
IN	Occupational Health & Safety Standards-Air
KY	Occupational Health & Safety Standards-Air
LA	Spill Reporting
MA	Oil and Hazardous Materials List
MA	Right to Know Substance List
MN	Hazardous Substance List
NJ	Right to Know Substance List
NJ	Spill Tax List
NC	Exposure Limits for Air Contaminants
NY	Release reporting; List of Hazardous Substances
PA	Right to Know
RI	Right to Know

National Regulations (Canada):

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Canadian NSN Registration: DSL

WHMIS Classification: D2B – Toxic Material
E- Corrosive Material

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

National Regulations (Europe) EINECS / ELINCS #: EINECS: 215-676-4

Labeling according to Directive 67/548/EEC.

Symbols	T	Toxic
	C	Corrosive
Phrases	R25	Toxic if swallowed.
	R34	Causes Burns.
	S22	Do not breathe dust.
	S26	In case of contact with eyes, Rinse immediately with plenty of water and seek medical advice.
	S37	Wear suitable gloves.
	S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible.)

16. OTHER INFORMATION

16.1 Ratings:

NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

Health = 3 Fire = 0 Instability = 1 Special = None

HMIS (HAZARDOUS MATERIAL INFORMATION SYSTEM)

Health = 3 Fire = 0 Reactivity = 1 PPE = Supplied by User; dependent on local conditions

16.2 Other Information:

To our actual knowledge, the information contained herein is accurate as of the date of this document. However, neither Solvay Fluorides, LLC nor any of its affiliates makes any warranty, express or implied, or accepts any liability in connection with this information or its use. This information is for use by technically skilled persons at their own discretion and risk and does not relate to the use of this product in combination with any other substance or any other process. This is not a license under any patent or other proprietary right. The user alone must finally determine suitability of any information or material for any contemplated use, the manner of use and whether any patents are infringed. This information gives typical properties only and is not to be used for specification purposes. Solvay Fluorides, LLC reserves the right to make additions, deletions or modifications to the information at any time without prior notification.

Material Safety Data Sheets contain country specific regulatory information; therefore, this MSDS is for use only by customers of Solvay Fluorides, LLC in the United States of America and, if specifically indicated, Canada and Mexico. If the user is located in a country other than the United States, please contact the Solvay Company serving your country for MSDS information applicable to your region.

The previous information is based upon our current knowledge and experience of our product and is not exhaustive. It applies to the product as defined by the specifications. In case of combinations

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of mixtures, one must confirm that no new hazards are likely to exist. In any case, the user is not exempt from observing all legal, administrative and regulatory procedures relating to the product, personal hygiene, and integrity of the work environment. (Unless noted to the contrary, the technical information applies only to pure product).

TRADEMARKS: All trade name of products referenced herein are either trademarks or registered trademarks of Solvay Fluorides, LLC or its affiliates, unless otherwise identified.

16.3 Reason for revision:

Supersedes edition: Solvay Fluorides LLC MSDS ABF-1103 dated: 11/13/03

Purpose of revision: Periodic Review and update.

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