

Safety Data Sheet

Version 3.0
Revision Date 12/08/2016

SDS Number 300000004651
Print Date 12/16/2017

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Bromine Trifluoride

Chemical formula : BrF3

Manufacturer/Importer/Distributor : Versum Materials US, LLC
8555 South River Parkway
Tempe, AZ 85284
Exporter EIN No.475632014
www.versummaterials.com

Telephone : (602)282-1000

Emergency telephone number (24h) : 800-523-9374 USA
+1 610 481 7711 International

2. HAZARDS IDENTIFICATION

GHS classification

Oxidizing gases - Category 1
Acute toxicity - Inhalation Category 2
Skin corrosion - Category 1A
Serious Eye Damage - Category 1

GHS label elements

Hazard pictograms/symbols



Signal Word: Danger

Hazard Statements:

H270: May cause or intensify fire; oxidiser.
H330: Fatal if inhaled.
H314: Causes severe skin burns and eye damage.

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H318:Causes serious eye damage.
EUH071:Corrosive to the respiratory tract.

Precautionary Statements:

Prevention : P220:Keep away from clothing and other combustible materials.
P244:Keep valves and fittings free from oil and grease.
P260:Do not breathe dust/fume/gas/mist/vapours/spray.
P264:Wash hands thoroughly after handling.
P271:Use only outdoors or in a well-ventilated area
P280a:Wear protective gloves and eye/face protection.
P284:Wear respiratory protection.

Response : P304+P340 :IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P320 :Specific treatment is urgent (see this label or SDS)
P370+P376 :In case of fire: Stop leak if safe to do so.
P363 :Wash contaminated clothing before reuse.

Storage : P403:Store in a well-ventilated place.
P405:Store locked up.

Disposal : P501:Disposal of contents/container to be specified in accordance with regulations.

Hazards not otherwise classified

Vigorously accelerates combustion.
May react violently with combustible materials.
Keep oil, grease, and combustibles away.
Do not breathe gas.
Compressed liquefied gas.

100 % of mixture consists of ingredients of unknown acute toxicity

3. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Weight)
Bromine trifluoride	7787-71-5	100 %

4. FIRST AID MEASURES

General advice : If additional information is needed consult the Safetygram – “Medical treatment Protocol for Hydrofluoric Acid Burns” available on the company website.
Prompt medical attention is required in all cases of exposure. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

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- Eye contact : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
Keep eye wide open while rinsing.
- Skin contact : A physician should be consulted for all exposures . Alternative treatment is to soak the affected areas in an iced 0.13% water solution (1:750) of Zephiran® chloride (benzalkonium chloride solution, NF). Use ice cubes, not shaved ice, to prevent frostbite. If soaking is impractical, soaks or compresses may be used. (Do not use Zephiran® for burns of the eye.) Burns covering an area greater than eight square inches require immediate treatment by a physician. If immersion is impractical, soaked compresses of the same solution should be applied to the area. Immersion or compresses must be used continuously for two hours. With gloved hand apply 2.5% calcium gluconate gel to the burn area. Burns covering an area greater than 25 square centimeters (4 square inches) require immediate treatment by a medical doctor. Remove contaminated clothing. Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and badly. Flush with copious amounts of water until treatment is available. Remove contaminated clothing. Drench affected area with water for at least 15 minutes.
- Ingestion : Ingestion is not considered a potential route of exposure.
- Inhalation : As soon as possible give 2.5% to 3% calcium gluconate solution by nebulizer. Move to fresh air. In case of shortness of breath, give oxygen. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. Mouth to mouth resuscitation is not recommended. If unconscious place in recovery position and seek medical advice. Consult a doctor.
- Inhalation : No data available.

Immediate Medical Attention and Special Treatment

- Treatment : If pain persists after above topical treatments, it may be necessary to inject 5% aqueous calcium gluconate beneath, around and into the burn area. This will more likely be necessary in the treatment of extensive burns or small burns where treatment has been delayed. Do not use local anesthetics. Resolution of pain is means to determine effective medical treatment. The patient should be observed for clinical symptoms of hypocalcemia following ingestion or inhalation or following extensive burns. Serum calcium, potassium and magnesium determinations must be performed immediately and periodically to monitor for hypocalcemia and electrolyte imbalance. EKGs should be done immediately and periodically to monitor for arrhythmias, hypocalcemia and hyperkalemia. If additional information is needed, consult the Safetygram "Treatment Protocol for Hydrofluoric Acid Burns available on our website. If exposed or concerned: Get medical attention/advice.

5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : None.

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- Specific hazards : Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Oxidant. Strongly supports combustion. May react violently with combustible materials. Some materials which are noncombustible in air may burn in the presence of an oxidizer. Use of water may result in the formation of very toxic aqueous solutions. Move away from container and cool with water from a protected position. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. Keep containers and surroundings cool with water spray. Do not allow run-off from fire fighting to enter drains or water courses. Gas is heavier than air and may collect in low areas or travel along the ground where there may be an ignition source present.
- Special protective equipment for fire-fighters : Use self-contained breathing apparatus and chemically protective clothing.

6. ACCIDENTAL RELEASE MEASURES

- Personal Precautions, Protective Equipment, and Emergency Procedures : Liquid releases should be isolated and ventilated with no entry permitted to release area. Evacuate personnel to safe areas. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Wear self-contained breathing apparatus when entering area unless atmosphere is proved to be safe. Use chemically protective clothing. Ventilate the area.
- Environmental precautions : Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
- Methods for cleaning up : Call Emergency Response number for advice. Do not attempt to neutralize product. Ventilate the area. Approach suspected leak areas with caution.
- Additional advice : Call the Air Products' Emergency Number for assistance. Evacuate area and do not approach spilled product. Do not attempt to neutralize product. If possible, stop flow of product. Increase ventilation to the release area and monitor concentrations. If leak is from cylinder or cylinder valve, call the emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Handling

Carbon steel, stainless steel or copper are suitable materials of construction. Any equipment that uses this product must be first thoroughly cleaned, rinsed with solvent, and dried. The equipment should then be treated (passivated) with increasing concentrations and/or pressures of fluorine as a final cleaning process. This treatment or passivation process, will allow the fluorine to react with and eliminate any impurities without ignition of equipment and will impart a protective fluoride surface layer. (Contact your supplier for proper passivation procedures.) Monel and nickel are preferred materials for high temperature applications. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Only experienced and properly instructed persons should handle compressed gases/cryogenic liquids.

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Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shock. Never attempt to lift a cylinder by its valve protection cap or guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Keep container valve outlets clean and free from contaminants particularly oil and water. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Installation of a cross purge assembly between the cylinder and the regulator is recommended. When returning cylinder install valve outlet cap or plug leak tight. Never permit oil, grease, or other readily combustible substances to come into contact with valves or containers containing oxygen or other oxidants. Do not use rapidly opening valves (e.g. ball valves). Open valve slowly to avoid pressure shock. Never pressurize the entire system at once. Use only with equipment cleaned for oxygen service and rated for cylinder pressure. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F). Never attempt to increase liquid withdrawal rate by pressurizing the container without first checking with the supplier. Never permit liquefied gas to become trapped in parts of the system as this may result in hydraulic rupture.

Storage

Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Full containers should be stored so that oldest stock is used first. Keep containers tightly closed in a cool, well-ventilated place. Stored containers should be periodically checked for general condition and leakage. Observe all regulations and local requirements regarding storage of containers. Local codes may have special requirements for toxic gas storage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Keep container tightly closed in a dry and well-ventilated place. Store containers in location free from fire risk and away from sources of heat and ignition. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Display "No Smoking or Open Flames" signs in the storage areas. Return empty containers in a timely manner. Flammable storage areas should be separated from oxygen and other oxidizers by a minimum distance of 20 ft. (6.1 m.) or by a barrier of non-combustible material at least 5 ft. (1.5 m.) high, having a fire resistance rating of at least 1/2 hour.

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Technical measures/Precautions

Containers should be segregated in the storage area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations. Keep away from combustible material. Where necessary containers containing oxygen and oxidants should be separated from flammable gases by a fire resistant partition. Segregate from flammable gases and other flammable materials in store.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits. Provide readily accessible eye wash stations and safety showers.

Personal protective equipment

- Respiratory protection : Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Users of breathing apparatus must be trained.
- Hand protection : Inner gloves of smooth leather and outer gloves of 17 mil nitrile. Sturdy work gloves are recommended for handling cylinders. 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.
- Eye protection : Polycarbonate full faceshield over safety glasses when connecting, disconnecting or opening cylinders. Safety glasses recommended when handling cylinders. A full faceshield should be worn in addition to safety glasses when connecting, disconnecting or opening cylinders.
- Skin and body protection : Direct contact with high concentrations of this product can react with and may ignite most materials used for personal protective equipment. PVC splash suit and double gloves (smooth leather inner, 17 mil nitrile outer) when connecting, disconnecting or opening cylinders. Emergency Situation: Totally encapsulating chemical protective suit with only natural fiber clothing worn underneath. Inner gloves of smooth leather and outer gloves of 17 mil nitrile. Safety shoes are recommended when handling cylinders.
- Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas. Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits. Gloves must be clean and free of oil and grease.

Exposure limit(s)

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Bromine trifluoride	Time Weighted Average (TWA): ACGIH	-	2.5 mg/m3
Bromine trifluoride	Time Weighted Average (TWA): OSHA Z2	-	2.5 mg/m3
Bromine trifluoride	Permissible exposure limit: OSHA Z1	-	2.5 mg/m3
Bromine trifluoride	Recommended exposure limit (REL): NIOSH	-	2.5 mg/m3
Bromine trifluoride	Time Weighted Average (TWA): OSHA Z1A	-	2.5 mg/m3
Bromine trifluoride	Time Weighted Average (TWA) Permissible Exposure Limit (PEL): US CA OEL	-	2.5 mg/m3
Bromine trifluoride	Time Weighted Average (TWA): TN OEL	-	2.5 mg/m3

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance	: Liquid. Colorless.
Odor	: Pungent. Irritating.
Odor threshold	: No data available.
pH	: No data available.
Melting point/range	: 48 °F (8.9 °C)
Boiling point/range	: 258 °F (125.7 °C)
Flash point	: No data available.
Evaporation rate	: No data available.
Flammability (solid, gas)	: Not applicable.
Upper/lower explosion/flammability limit	: Not applicable.
Vapor pressure	: 5.86 mmHg
Water solubility	: No data available.
Relative vapor density	: 4.727 (air = 1)
Relative density	: No data available.
Partition coefficient (n-octanol/water)	: No data available.
Auto-ignition temperature	: No data available.
Decomposition temperature	: No data available.
Viscosity	: No data available.

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Molecular Weight : 136.9 g/mol
Density : 175.423 lb/ft³ (2.81 g/cm³) at 70 °F (21 °C)

10. STABILITY AND REACTIVITY

Chemical Stability : Stable under normal conditions.
Conditions to avoid : No data available.
Materials to avoid : Water.
Brass.
Viton, Buna-N or Neoprene elastomers.
Avoid oil, grease and all other combustible materials.
Organic materials.
Flammable materials.
Hazardous decomposition products : Hydrogen fluoride.
Possibility of hazardous Reactions/Reactivity : No data available.

11. TOXICOLOGICAL INFORMATION

11.1. Information on toxicological effects

Likely routes of exposure

Effects on Eye : May cause eye irritation. May cause permanent eye injury. May cause blindness.
Effects on Skin : Causes skin irritation. Causes skin burns. Contact with liquid may cause cold burns/frostbite.
Inhalation Effects : If inhaled, remove to fresh air.
Ingestion Effects : No data available.
Symptoms : No data available.

Acute toxicity

Acute Oral Toxicity : No data is available on the product itself.
Inhalation : LC50 :
Acute Dermal Toxicity : No data is available on the product itself.
Skin corrosion/irritation : No data available.

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Serious eye damage/eye irritation : No data available.

Sensitization. : No data available.

Chronic toxicity or effects from long term exposures

Carcinogenicity : No data available.

Reproductive toxicity : No data is available on the product itself.

Germ cell mutagenicity : No data is available on the product itself.

Specific target organ systemic toxicity (single exposure) : No data available.

Specific target organ systemic toxicity (repeated exposure) : No data available.

Aspiration hazard : No data available.

Delayed and Immediate Effects and Chronic Effects from Short and Long Term Exposure

Animals exposed to hydrogen fluoride have exhibited kidney, lung, heart and liver damage., Direct toxicity of this material may be accompanied by fluoride absorption and systemic depletion of calcium ion, an essential electrolyte. Chronic exposure may cause abnormal calcification in the bone structure (fluorosis) due to low level systemic absorption of fluoride. Fluoride toxicity from acute inhalation exposure to this product is unlikely due to the noxious and corrosive nature of this gas. Death from respiratory tract damage would likely occur before significant amounts of fluoride are absorbed., The potential for hydrogen fluoride formation exists with every exposure; therefore, its toxicity must also be considered.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity : No data is available on the product itself.

Toxicity to other organisms : No data available.

Persistence and degradability

Biodegradability : No data is available on the product itself.

Mobility : Because of its high volatility, the product is unlikely to cause ground pollution.

Bioaccumulation : Refer to Section 9 "Partition Coefficient (n-octanol/water)".

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13. DISPOSAL CONSIDERATIONS

- Waste from residues / unused products : In accordance with local and national regulations. Return unused product in original cylinder to supplier. Contact supplier if guidance is required. Must not be discharged to atmosphere.
- Contaminated packaging : Return cylinder to supplier.

14. TRANSPORT INFORMATION

DOT

- UN/ID No. : UN1746
Proper shipping name : Bromine trifluoride
Class or Division : 5.1
Packing group : I
Label(s) : 5.1 (6.1, 8)
PIH Zone : B
Marine Pollutant : No

IATA

Transport Forbidden

IMDG

- UN/ID No. : UN1746
Proper shipping name : BROMINE TRIFLUORIDE
Class or Division : 5.1
Packing group : I
Label(s) : 5.1 (6.1, 8)
Marine Pollutant : No

TDG

- UN/ID No. : UN1746
Proper shipping name : BROMINE TRIFLUORIDE
Class or Division : 5.1
Packing group : I
Label(s) : 5.1 (6.1, 8)
Marine Pollutant : No

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment.
Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event

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of an accident or an emergency. The transportation information is not intended to convey all specific regulatory data relating to this material. For complete transportation information, contact customer service.

15. REGULATORY INFORMATION

Toxic Substance Control Act (TSCA) 12(b) Component(s):

None.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Not on Inventory.
Australia	AICS	Included on Inventory.
Japan	ENCS	Not on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Not on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification

Acute Health Hazard Fire Hazard. Sudden Release of Pressure Hazard.

Acute Health Hazard Chronic Health Hazard

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)

This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

NFPA Rating

Health : 4
Fire : 0
Instability : 2
Special : W 2

HMIS Rating

Health : 3
Flammability : 0
Physical hazard : 3

Prepared by : Versum Materials, Product Regulatory Department

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Telephone : (602)282-1000

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For additional information, please visit Versum Materials' Product Stewardship web site.
<http://www.versummaterials.com/productstewardship/>
