

BORON TRIFLUORIDE ETHYL ETHER COMPLEX

GHS Safety Data Sheet

Version No:4.1.1.1

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Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

BORON TRIFLUORIDE ETHYL ETHER COMPLEX

OTHER NAMES

C₄H₁₀B-F₃O, (C₂H₅)₂O.BF₃, "boron trifluoride etherate", "boron fluoride ethyl ether", "boron fluoride etherate", "ethyl ether-boron trifluoride complex", "ethyl ether compd. with boron fluoride (BF₃) (1:1)", "borane trifluoro-, compd. with 1, 1'-oxybis(ethane) (1:1)", "boron fluoride diethyl etherate", "boron fluoride-ethyl etherate", "boron fluoride monoetherate", "boron trifluoride-diethyl etherate", "boron trifluoride diethyletherate", "boron trifluoride-ether complex", "boron trifluoride-ethyl ether", "boron trifluoride-ethyl etherate", "boron, trifluoro(1, 1'-oxybis(ethane))-, (t-4)-", "trifluoroborane diethyl etherate", "trifluoroboron etherate"

PROPER SHIPPING NAME

BORON TRIFLUORIDE ETHYL ETHER COMPLEX

PRODUCT USE

Lewis acid catalyst in acetylation, alkylation, polymerisation, dehydration and condensation reactions; reagent for the preparation of trialkyloxonium fluoroborates and for the mild hydrolysis of tosylhydrazones of carbonyl compounds.

SUPPLIER

Company: S D FINE- CHEM LIMITED

Address:

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Section 2 - HAZARDS IDENTIFICATION

GHS Classification

Acute Toxicity Category 2

Acute Toxicity Category 4

Flammable Liquid Category 3

Metal Corrosion Category 1

Serious Eye Damage Category 1

Skin Corrosion/Irritation Category 1A

STOT - RE Category 1



EMERGENCY OVERVIEW

HAZARD

DANGER

Determined by using GHS criteria

H226 Flammable liquid and vapour.

H290 May be corrosive to metals.

H302 Harmful if swallowed.

H314 Causes severe skin burns and eye damage.

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Section 2 - HAZARDS IDENTIFICATION

H318	Causes serious eye damage.
H330	Fatal if inhaled.
H372	Causes damage to organs through prolonged or repeated exposure.

PRECAUTIONARY STATEMENTS

Prevention

Code	Phrase
P210	Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P233	Keep container tightly closed.
P234	Keep only in original container.
P240	Ground/bond container and receiving equipment.
P241	Use explosion- proof electrical/ventilating/lighting/ ... /equipment
P242	Use only non- sparking tools.
P243	Take precautionary measures against static discharge.
P260	Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
P264	Wash ... thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P271	Use only outdoors or in a well- ventilated area.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P284	Wear respiratory protection.

Response

Code	Phrase
P301+P312	IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P301+P330+P331	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
P303+P361+P353	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304+P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P305+P351+P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P310	Immediately call a POISON CENTER or doctor/physician.
P314	Get medical advice/attention if you feel unwell.
P320	Specific treatment is urgent (see MSDS).
P330	Rinse mouth.
P363	Wash contaminated clothing before reuse.
P390	Absorb spillage to prevent material damage.

Storage

Code	Phrase
P403+P233	Store in a well- ventilated place. Keep container tightly closed.
P403+P235	Store in a well- ventilated place. Keep cool.
P405	Store locked up.
P406	Store in corrosive resistant container or with a resistant inner liner.

Disposal

Code	Phrase
P501	Dispose of contents/container to ...

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

NAME	CAS RN	%
boron trifluoride ethyl ether complex 109-63-7>98		
reacts with moisture in air to produce		
diethyl ether	60-29-7	
boron trifluoride	7637-07-2	
hydrofluoric acid	7664-39-3	

Section 4 - FIRST AID MEASURES

SWALLOWED

- For advice, contact a Poisons Information Centre or a doctor at once.
- Urgent hospital treatment is likely to be needed.
- If swallowed do NOT induce vomiting.
- If vomiting occurs, lean patient forward or place on left side (head-down position, if possible) to maintain open airway and prevent aspiration.

EYE

- If this product comes in contact with the eyes:

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Section 4 - FIRST AID MEASURES

- Immediately hold eyelids apart and flush the eye continuously with running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Continue flushing until advised to stop by the Poisons Information Centre or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.

SKIN

- If skin or hair contact occurs:
- Immediately flush body and clothes with large amounts of water, using safety shower if available.
- Quickly remove all contaminated clothing, including footwear.
- Wash skin and hair with running water. Continue flushing with water until advised to stop by the Poisons Information Centre.
- Transport to hospital, or doctor.

INHALED

- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.
- Inhalation of vapours or aerosols (mists, fumes) may cause lung oedema.
- Corrosive substances may cause lung damage (e.g. lung oedema, fluid in the lungs).
- As this reaction may be delayed up to 24 hours after exposure, affected individuals need complete rest (preferably in semi-recumbent posture) and must be kept under medical observation even if no symptoms are (yet) manifested.
- Before any such manifestation, the administration of a spray containing a dexamethasone derivative or beclomethasone derivative may be considered.

NOTES TO PHYSICIAN

- For acute or short term repeated exposures to strong acids:
- Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
- Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling
- Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
- Strong acids produce a coagulation necrosis characterised by formation of a coagulum (eschar) as a result of the dessicating action of the acid on proteins in specific tissues.

For acute or short term repeated exposures to fluorides:

- Fluoride absorption from gastro-intestinal tract may be retarded by calcium salts, milk or antacids.
- Fluoride particulates or fume may be absorbed through the respiratory tract with 20-30% deposited at alveolar level.
- Peak serum levels are reached 30 mins. post-exposure; 50% appears in the urine within 24 hours.
- For acute poisoning (endotracheal intubation if inadequate tidal volume), monitor breathing and evaluate/monitor blood pressure and pulse frequently since shock may supervene with little warning. Monitor ECG immediately; watch for arrhythmias and evidence of Q-T prolongation or T-wave changes. Maintain monitor. Treat shock vigorously with isotonic saline (in 5% glucose) to restore blood volume and enhance renal excretion.

Section 5 - FIRE FIGHTING MEASURES

EXTINGUISHING MEDIA

- DO NOT use water.

FIRE FIGHTING

- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear full body protective clothing with breathing apparatus.
- Prevent, by any means available, spillage from entering drains or water course.

FIRE/EXPLOSION HAZARD

- Combustion products include: carbon dioxide (CO₂), carbon monoxide (CO), hydrogen fluoride, metal oxides, other pyrolysis products typical of burning organic material.
- May emit corrosive fumes.
- Flammable.
- Moderate fire and explosion hazard when exposed to heat or flame.
- Acids may react with metals to produce hydrogen, a highly flammable and explosive gas.
- Heating may cause expansion or decomposition leading to violent rupture of containers.

FIRE INCOMPATIBILITY

- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result.
- Keep dry.
- NOTE: May develop pressure in containers; open carefully. Vent periodically.

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Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapours and contact with skin and eyes.
- Control personal contact with the substance, by using protective equipment.
- Drains for storage or use areas should have retention basins for pH adjustments and dilution of spills before discharge or disposal of material.
- Check regularly for spills and leaks.

MAJOR SPILLS

- Clear area of personnel and move upwind.
- Alert Fire Brigade and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.

Personal Protective Equipment advice is contained in Section 8 of the MSDS.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

- DO NOT allow clothing wet with material to stay in contact with skin.
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.
- Containers, even those that have been emptied, may contain explosive vapours.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.

SUITABLE CONTAINER

- Lined metal can. Lined metal drum. Lined metal safety cans.
- Packing as supplied and/or recommended by manufacturer.
- Plastic lining or containers may only be used if approved for flammable liquid (non-polar type).
- DO NOT use aluminium or galvanised containers.

For low viscosity materials

- Drums and jerricans must be of the non-removable head type.
 - Where a can is to be used as an inner package, the can must have a screwed enclosure. <</>.
 - Check regularly for spills and leaks.
 - Material is corrosive to most metals, glass and other siliceous materials.
- Corrodes steel.

STORAGE INCOMPATIBILITY

■ Boron trifluoride ethyl ether complex:

- forms unstable peroxides unless inhibited
- reacts violently with moist air, steam, forming hydrogen fluoride
- reacts violently with oxidisers, ethereal lithium, aluminium hydride and other powerful reducing agents
- attacks metals, glass, concrete (in the presence of moisture).

Boron trifluoride:

- reacts with moist air, water, steam, producing hydrogen fluoride, boric acid and fluoboric acid
- reacts violently with allyl chloride, alkyl nitrate, benzyl nitrate, calcium oxide, ethyl ether, iodine, magnesium tetrahydroaluminate, active metals (except magnesium)
- may explode on contact with monomers
- corrodes most metals in the presence of moisture.

Salts of inorganic fluoride:

- react with water forming acidic solutions.
- are violent reactive with boron, bromine pentafluoride, bromine trifluoride, calcium disilicide, calcium hydride, oxygen difluoride, platinum, potassium.
- in aqueous solutions are incompatible with sulfuric acid, alkalis, ammonia, aliphatic amines, alkanolamines, alkylene oxides, amides, epichlorohydrin, isocyanates, nitromethane, organic anhydrides, vinyl acetate.
- corrode metals in presence of moisture.

Hydrogen fluoride:

- reacts violently with strong oxidisers, acetic anhydride, alkalis, 2-aminoethanol, arsenic trioxide (with generation of heat), bismuthic acid, calcium oxide, chlorosulfonic acid, cyanogen fluoride, ethylenediamine, ethyleneimine, fluorine (fluorine gas reacts vigorously with a 50% hydrofluoric acid solution and may burst into flame), nitrogen trifluoride, N-phenylazopiperidine, oleum, oxygen difluoride, phosphorus pentoxide, potassium permanganate, potassium tetrafluorosilicate(2-), beta-propiolactone, propylene oxide, sodium, sodium tetrafluorosilicate, sulfuric acid, vinyl acetate

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Section 7 - HANDLING AND STORAGE

- reacts (possibly violently) with aliphatic amines, alcohols, alkanolamines, alkylene oxides, aromatic amines, amides, ammonia, ammonium hydroxide, epichlorohydrin, isocyanates, metal acetylides, metal silicides, methanesulfonic acid, nitrogen compounds, organic anhydrides, oxides, silicon compounds, vinylidene fluoride
- attacks glass and siliceous materials, concrete, ceramics, metals (flammable hydrogen gas may be produced), metal alloys, some plastics, rubber coatings, leather, and most other materials with the exception of lead, platinum, polyethylene, wax.
- Avoid contamination with strong oxidising agents as violent reaction may occur, with spontaneous decomposition or explosion.
- Segregate from alcohol, water.
- Avoid strong acids, bases.
- Segregate from alkalis, oxidising agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.
- Reacts with mild steel, galvanised steel / zinc producing hydrogen gas which may form an explosive mixture with air.
- NOTE: May develop pressure in containers; open carefully. Vent periodically.

STORAGE REQUIREMENTS

- Store in approved flammable liquid storage area.
- No smoking, naked lights/ignition sources.
- Keep containers securely sealed.
- Store away from incompatible materials in a cool, dry, well-ventilated area.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	Peak ppm	Peak mg/m ³
India Permissible Levels of Certain Chemical Substances in Work Environment	boron trifluoride (Boron trifluoride)	1	3
India Permissible Levels of Certain Chemical Substances in Work Environment	hydrofluoric acid (Hydrogen fluoride (as F))	3	2.5

The following materials had no OELs on our records

boron trifluoride ethyl ether :CAS:109-63-7

• diethyl ether:

CAS:60- 29- 7

MATERIAL DATA

BORON TRIFLUORIDE ETHYL ETHER COMPLEX :

BORON TRIFLUORIDE:

DIETHYL ETHER:

HYDROFLUORIC ACID:

- Exposed individuals are reasonably expected to be warned, by smell, that the Exposure Standard is being exceeded.

Odour Safety Factor (OSF) is determined to fall into either Class A or B.

The Odour Safety Factor (OSF) is defined as:

OSF= Exposure Standard (TWA) ppm/ Odour Threshold Value (OTV) ppm

Classification into classes follows:

Class	OSF	Description
A	550	Over 90% of exposed individuals are aware by smell that the Exposure Standard (TLV- TWA for example) is being reached, even when distracted by working activities
B	26- 550	As " A" for 50- 90% of persons being distracted
C	1- 26	As " A" for less than 50% of persons being distracted
D	0.18- 1	10- 50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	As " D" for less than 10% of persons aware of being tested

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BORON TRIFLUORIDE:

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

HYDROFLUORIC ACID:

- Odour Threshold for hydrogen fluoride: 0.042 ppm

NOTE: Detector tubes for hydrogen fluoride, measuring in excess of 1.5 ppm, are available commercially. Long-term measurements (8 hrs) may be conducted to detect concentrations exceeding 0.25 ppm.

Hydrogen fluoride is a primary irritant which as a gas causes severe respiratory irritation and as a liquid which causes severe and painful burns to the skin and eyes.

BORON TRIFLUORIDE ETHYL ETHER COMPLEX:

DIETHYL ETHER:

- For diethyl ether:

NOTE: Detector tubes for diethyl ether, measuring in excess of 100 ppm, are commercially available.

Narcotic properties leading to anaesthesia and eye and respiratory irritation are thought to be minimised at exposures at or below the recommended TLV-TWA.

Odour Safety Factor (OSF)

OSF=45 (ETHYL ETHER).

BORON TRIFLUORIDE ETHYL ETHER COMPLEX :

BORON TRIFLUORIDE:

- For boron trifluoride:

Odour Threshold Value: 1.5 ppm

Exposure Standards of 0.3 ppm have been suggested in some circles. A concentration of 1 ppm is detectable by smell but is felt to be insufficient as a warning of overexposure, because the odour is not unpleasant.

Odour Safety Factor(OSF)

OSF=71 (boron trifluoride).

BORON TRIFLUORIDE ETHYL ETHER COMPLEX:

- No exposure limits set by NOHSC or ACGIH.

DIETHYL ETHER:

■ The recommended TLV-TWA for hydroquinone takes into account the toxicology of hydroquinone and experience of industrial exposures to benzenediols. Exposure at or below the limit is thought to minimise the risk to workers of eye injury, dermatitis and central nervous system effects.

BORON TRIFLUORIDE:

Odour Threshold Value: 1.5 ppm

Exposure Standards of 0.3 ppm have been suggested in some circles.

A concentration of 1 ppm is detectable by smell but is felt to be insufficient as a warning of overexposure, because the odour is not unpleasant.

PERSONAL PROTECTION



RESPIRATOR

• Type BAX-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 143:2000 & 149:2001, ANSI Z88 or national equivalent)

EYE

- Safety glasses with unperforated side shields may be used where continuous eye protection is desirable, as in laboratories; spectacles are not sufficient where complete eye protection is needed such as when handling bulk-quantities, where there is a danger of splashing, or if the material may be under pressure
- Chemical goggles whenever there is a danger of the material coming in contact with the eyes; goggles must be properly fitted
- Full face shield (20 cm, 8 in minimum) may be required for supplementary but never for primary protection of eyes; these afford face protection.
- Alternatively a gas mask may replace splash goggles and face shields.

HANDS/FEET

- Elbow length PVC gloves.
 - When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
- The selection of the suitable gloves does not only depend on the material, but also on further marks of quality which vary from manufacturer to manufacturer. Where the chemical is a preparation of several substances, the resistance of the glove material can not be calculated in advance and has therefore to be checked prior to the application.
- The exact break through time for substances has to be obtained from the manufacturer of the protective gloves and has to be observed when making a final choice.
- Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include:
- Neoprene gloves.

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Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

OTHER

- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Some plastic personal protective equipment (PPE) (e.g. gloves, aprons, overshoes) are not recommended as they may produce static electricity.
- For large scale or continuous use wear tight-weave non-static clothing (no metallic fasteners, cuffs or pockets), non sparking safety footwear.

ENGINEERING CONTROLS

■ Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent of worker interactions to provide this high level of protection.

The basic types of engineering controls are:

Process controls which involve changing the way a job activity or process is done to reduce the risk.

Enclosure and/or isolation of emission source which keeps a selected hazard "physically" away from the worker and ventilation that strategically "adds" and "removes" air in the work environment.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE

Colourless fuming liquid which hydrolyses immediately on contact with water.

PHYSICAL PROPERTIES

Liquid.

Corrosive.

Acid.

Toxic or noxious vapours/gas.

State	Liquid	Molecular Weight	141.93
Melting Range (°C)	- 58	Viscosity	Not Available
Boiling Range (°C)	126	Solubility in water (g/L)	Reacts
Flash Point (°C)	47.78	pH (1% solution)	Not available.
Decomposition Temp (°C)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°C)	Not available	Vapour Pressure (kPa)	0.56 @ 20 C
Upper Explosive Limit (%)	36	Specific Gravity (water=1)	1.154
Lower Explosive Limit (%)	1.9	Relative Vapour Density (air=1)	>1
Volatile Component (%vol)	100	Evaporation Rate	Not available

Section 10 - CHEMICAL STABILITY AND REACTIVITY INFORMATION

CONDITIONS CONTRIBUTING TO INSTABILITY

- Contact with alkaline material liberates heat.

For incompatible materials - refer to Section 7 - Handling and Storage.

Section 11 - TOXICOLOGICAL INFORMATION

Health hazard summary table:

Acute toxicity	Acute Tox. (inhal) 2 Acute Tox. (oral) 4
Skin corrosion/irritation	Skin Corr. 1 A
Serious eye damage/irritation	Eye Dam. 1
Respiratory or skin sensitization	Not applicable
Germ cell mutagenicity	Not applicable
Carcinogenicity	Not applicable
Reproductive toxicity	Not applicable
STOT- single exposure	Not applicable
STOT- repeated exposure	STOT RE 1
Aspiration hazard	Not applicable

continued...

POTENTIAL HEALTH EFFECTS**ACUTE HEALTH EFFECTS****SWALLOWED**

■ Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.

■ Ingestion of acidic corrosives may produce burns around and in the mouth, the throat and oesophagus.

Immediate pain and difficulties in swallowing and speaking may also be evident.

■ Fluoride causes severe loss of calcium in the blood, with symptoms appearing several hours later including painful and rigid muscle contractions of the limbs.

Cardiovascular collapse can occur and may cause death with increased heart rate and other heart rhythm irregularities.

EYE

■ If applied to the eyes, this material causes severe eye damage.

■ Direct eye contact with acid corrosives may produce pain, tears, sensitivity to light and burns.

Mild burns of the epithelia generally recover rapidly and completely.

■ Experiments in which a 20-percent aqueous solution of hydrofluoric acid (hydrogen fluoride) was instilled into the eyes of rabbits caused immediate damage in the form of total corneal opacification and conjunctival ischemia; within an hour, corneal stroma edema occurred, followed by necrosis of anterior ocular structures.

SKIN

■ Skin contact with acidic corrosives may result in pain and burns; these may be deep with distinct edges and may heal slowly with the formation of scar tissue.

■ Skin contact is not thought to produce harmful health effects (as classified under EC Directives using animal models).

Systemic harm, however, has been identified following exposure of animals by at least one other route and the material may still produce health damage following entry through wounds, lesions or abrasions.

■ Fluorides are easily absorbed through the skin and cause death of soft tissue and erode bone.

Healing is delayed and death of tissue may continue to spread beneath skin.

■ Open cuts, abraded or irritated skin should not be exposed to this material.

■ Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.

Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED

■ Inhalation of vapours or aerosols (mists, fumes), generated by the material during the course of normal handling, may produce toxic effects.

■ The material can cause respiratory irritation in some persons.

The body's response to such irritation can cause further lung damage.

■ Corrosive acids can cause irritation of the respiratory tract, with coughing, choking and mucous membrane damage.

There may be dizziness, headache, nausea and weakness.

■ The severity of effects of boron trifluoride depend on concentration and duration of exposure.

Inhalation causes irritation of the throat, coughing and laboured breathing.

■ Acute effects of fluoride inhalation include irritation of nose and throat, coughing and chest discomfort.

A single acute over-exposure may even cause nose bleed.

■ Acute inhalation exposures to hydrogen fluoride (hydrofluoric acid) vapours produce severe eye, nose, and throat irritation; delayed fever, cyanosis, and pulmonary edema; and may cause death.

Even fairly low airborne concentrations of hydrogen fluoride produce rapid onset of eye, nose, and throat irritation.

CHRONIC HEALTH EFFECTS

■ Repeated or prolonged exposure to acids may result in the erosion of teeth, swelling and/or ulceration of mouth lining.

Irritation of airways to lung, with cough, and inflammation of lung tissue often occurs. Chronic exposure may inflame the skin or conjunctiva.

Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.

Toxic: danger of serious damage to health by prolonged exposure through inhalation.

This material can cause serious damage if one is exposed to it for long periods. It can be assumed that it contains a substance which can produce severe defects. This has been demonstrated via both short- and long-term experimentation.

Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.

Boron trifluoride fumes strongly in moist air or on skin contact to form corrosive acids which can affect the kidneys. The long term effects are unknown. Repeated overexposure may cause drying of nose linings, nosebleed, tooth discolouration, asthma and lung inflammation.

Borate can accumulate in the testes and deplete germ cells and cause withering of the testicles, according to animal testing.

Hair loss, skin inflammation, stomach ulcer and anaemia can all occur. Repeated swallowing or inhalation irritates the stomach, causes a loss of appetite, disturbed digestion, nausea and vomiting, red rash, dry skin and mucous membranes, reddening of the tongue, cracking of the lips, inflamed conjunctiva, swelling of the eyelids and kidney injury. Animal testing revealed prolonged ingestion causes effects to the reproductive system in both males and females.

Extended exposure to inorganic fluorides causes fluorosis, which includes signs of joint pain and stiffness, tooth discolouration, nausea and vomiting, loss of appetite, diarrhoea or constipation, weight loss, anaemia, weakness and general unwellness. There may also be frequent urination and thirst. Redness, itchiness and allergy-like inflammation of the skin and mouth cavity can occur. The central nervous system may be involved.

Hydrogen fluoride easily penetrates the skin and causes destruction and corrosion of the bone and underlying tissue. Ingestion

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Section 11 - TOXICOLOGICAL INFORMATION

causes severe pains and burns in the mouth and throat and blood calcium levels are dangerously reduced. Symptoms include spasm and twitching of the muscles, high fever, convulsions and general extreme pain. Inhalation may cause corrosion of the throat, nose and lungs, leading to severe inflammation and lung swelling.

Fluoroborates accumulate in the thyroid gland, preventing the uptake of iodine. Chronic exposure to boron trifluoride can increase levels of bone fluoride and cause dental fluorosis.

TOXICITY AND IRRITATION

■ Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

The material may produce respiratory tract irritation, and result in damage to the lung including reduced lung function.

The material may cause severe skin irritation after prolonged or repeated exposure and may produce on contact skin redness, swelling, the production of vesicles, scaling and thickening of the skin. Repeated exposures may produce severe ulceration.

CARCINOGEN

ethyl ether complex	International Agency for Group 3 Not classifiable as Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs			to its carcinogenicity to humans
boron trifluoride	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3	Not classifiable as to its carcinogenicity to humans
hydrofluoric acid	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3	Not classifiable as to its carcinogenicity to humans

SKIN

diethyl ether	GESAMP/EHS Composite List - GESAMP Hazard Profiles	D1: skin irritation/corrosion	1
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Section 12 - ECOLOGICAL INFORMATION

This material and its container must be disposed of as hazardous waste.

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
ethyl ether complex LOWNoDataLOWHIGH				
boron trifluoride	No Data Available	Available No Data Available	No Data Available	No Data Available
hydrofluoric acid	No Data Available	No Data Available	LOW	No Data Available

Section 13 - DISPOSAL CONSIDERATIONS

- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:

- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.

- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction.
- DO NOT allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.

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BORON TRIFLUORIDE ETHYL ETHER COMPLEX

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Section 13 - DISPOSAL CONSIDERATIONS

- Where in doubt contact the responsible authority.
- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Treat and neutralise at an approved treatment plant. Treatment should involve: Neutralisation with soda-ash or soda-lime followed by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or Incineration in a licenced apparatus
- Decontaminate empty containers with 5% aqueous sodium hydroxide or soda ash, followed by water. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION



Labels Required: CORROSIVE,FLAMMABLE LIQUID

HAZCHEM: 4WE

Land Transport UNDG:

Class or division:	8	Subsidiary risk:	3
UN No.:	2604	UN packing group:	I

ShippingName:BORON TRIFLUORIDE ETHYL ETHER COMPLEX

Air Transport IATA:

ICAO/IATA Class:	8	ICAO/IATA Subrisk:	3
UN/ID Number:	2604	Packing Group:	I
Special provisions:	None		
Cargo Only			
Packing Instructions:	854	Maximum Qty/Pack:	2.5 L
Passenger and Cargo			
Packing Instructions:	850	Maximum Qty/Pack:	0.5 L
Passenger and Cargo			
Limited Quantity			
Packing Instructions:	Forbidden	Maximum Qty/Pack:	Forbidden

ShippingName:BORON TRIFLUORIDE ETHYL ETHER COMPLEX

Maritime Transport IMDG:

IMDG Class:	8	IMDG Subrisk:	3
UN Number:	2604	Packing Group:	I
EMS Number:	F- E, S- C	Special provisions:	None
Limited Quantities:	0		

ShippingName:BORON TRIFLUORIDE ETHYL ETHER COMPLEX

Section 15 - REGULATORY INFORMATION

REGULATIONS

boron trifluoride ethyl ether complex (CAS: 109-63-7) is found on the following regulatory lists;

"Acros Transport Information","India Chemical Accidents Rules - Schedule 1: List of Hazardous Chemicals","Sigma-AldrichTransport Information"

Regulations for ingredients

ethyl ether complex (CAS: 60-29-7) is found on the following regulatory lists;

"FisherTransport Information","GESAMP/EHS Composite List - GESAMP Hazard Profiles","IMO IBC Code Chapter 17: Summary of minimum requirements","IMO MARPOL 73/78 (Annex II) - List of Other Liquid Substances","India Chemical Accidents Rules - Schedule 1: List of Hazardous Chemicals","India Chemical Accidents Rules - Schedule 2: Threshold Quantities","India Chemical Accidents Rules - Schedule 3: Named Chemicals","India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 1: List of Hazardous and Toxic Chemicals","India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 2: Isolated storage at Installations other than those covered by Schedule 4","India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 3: List of Hazardous Chemicals for Application of Rules 5 and 7 to 15","International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs","International Council of Chemical Associations (ICCA) - High Production Volume

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BORON TRIFLUORIDE ETHYL ETHER COMPLEX

Section 15 - REGULATORY INFORMATION

List", "International Fragrance Association (IFRA) Survey: Transparency List", "OECD List of High Production Volume (HPV) Chemicals", "OSPAR National List of Candidates for Substitution – Norway", "Sigma-Aldrich Transport Information", "United Nations Consolidated List of Products Whose Consumption and/or Sale Have Been Banned, Withdrawn, Severely Restricted or Not Approved by Governments", "United Nations Convention Against Illicit Traffic in Narcotic Drugs and Psychotropic Substances - Table II", "United Nations List of Precursors and Chemicals Frequently used in the Illicit Manufacture of Narcotic Drugs and Psychotropic Substances Under International Control (Red List) - Table II"

boron trifluoride (CAS: 7637-07-2, 13319-75-0) is found on the following regulatory lists;

"Acros Transport Information", "India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 1: List of Hazardous and Toxic Chemicals", "India Permissible Levels of Certain Chemical Substances in Work Environment", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "OECD List of High Production Volume (HPV) Chemicals", "Sigma-Aldrich Transport Information"

hydrofluoric acid (CAS: 7664-39-3) is found on the following regulatory lists;

"Fisher Transport Information", "India Chemical Accidents Rules - Schedule 1: List of Hazardous Chemicals", "India Chemical Accidents Rules - Schedule 3: Named Chemicals", "India Hazardous Wastes (Management, Handling and Transboundary Movement) Rules - Schedule 2: List of Wastes Constituents with Concentration Limits", "India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 1: List of Hazardous and Toxic Chemicals", "India Manufacture, Storage and Import of Hazardous Chemical Rules - Schedule 3: List of Hazardous Chemicals for Application of Rules 5 and 7 to 15", "India Permissible Levels of Certain Chemical Substances in Work Environment", "International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs", "OECD List of High Production Volume (HPV) Chemicals", "Sigma-Aldrich Transport Information", "The Australia Group Export Control List: Chemical Weapons Precursors", "WHO Guidelines for Drinking-water Quality - Guideline values for chemicals that are of health significance in drinking-water"

Section 16 - OTHER INFORMATION

INGREDIENTS WITH MULTIPLE CAS NUMBERS

Ingredient Name
boron trifluoride

CAS
7637- 07- 2, 13319- 75- 0

■ Classification of the preparation and its individual components has drawn on official and authoritative sources using available literature references.

■ The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings.

The above information is believed to be accurate and represent the best information currently available to us, but does not represent any warranty expressed or implied of the properties of the product. User should make their own investigation to determine the suitability of the information for their particular purpose.

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