

Boron trifluoride diethyl etherate

sc-214619

Material Safety Data Sheet



The Power is Question

Hazard Alert Code Key:

EXTREME

HIGH

MODERATE

LOW

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME

Boron trifluoride diethyl etherate

STATEMENT OF HAZARDOUS NATURE

CONSIDERED A HAZARDOUS SUBSTANCE ACCORDING TO OSHA 29 CFR 1910.1200.

NFPA



SUPPLIER

Company: Santa Cruz Biotechnology, Inc.

Address:

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Santa Cruz, CA 95060

Telephone: 800.457.3801 or 831.457.3800

Emergency Tel: CHEMWATCH: From within the US and Canada:

877-715-9305

Emergency Tel: From outside the US and Canada: +800 2436 2255

(1-800-CHEMCALL) or call +613 9573 3112

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.

SYNONYMS

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)", "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"

Section 2 - HAZARDS IDENTIFICATION

CANADIAN WHMIS SYMBOLS



EMERGENCY OVERVIEW

RISK

Harmful if swallowed.

Toxic by inhalation.

Causes severe burns.

Risk of serious damage to eyes.

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

Reacts violently with water liberating extremely flammable gases.

Flammable.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED

- The material can produce severe chemical burns within the oral cavity and gastrointestinal tract following ingestion.
- 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 esophagus. Immediate pain and difficulties in swallowing and speaking may also be evident. Swelling of the epiglottis may make it difficult to breathe which may result in suffocation. More severe exposure may result in vomiting blood and thick mucus, shock, abnormally low blood pressure, fluctuating pulse, shallow respiration and clammy skin, inflammation of stomach wall, and rupture of esophageal tissue. Untreated shock may eventually result in kidney failure. Severe cases may result in perforation of the stomach and abdominal cavity with consequent infection, rigidity and fever. There may be severe narrowing of the esophageal or pyloric sphincters; this may occur immediately or after a delay of weeks to years. There may be coma and convulsions, followed by death due to infection of the abdominal cavity, kidneys or lungs.
- 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. The brain and kidneys may be affected. Other toxic effects include headache, increased saliva output, jerking of the eyeball and dilated pupils, lethargy, stupor, coma and rarely, convulsions.

EYE

- The material can produce severe chemical burns to the eye following direct contact. Vapors or mists may be extremely irritating.
- 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. Severe burns produce long-lasting and possibly irreversible damage. The appearance of the burn may not be apparent for several weeks after the initial contact. The cornea may ultimately become deeply opaque resulting in blindness.
- 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

- The material can produce severe chemical burns following direct contact with the 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 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. Good hygiene practice requires that exposure be kept to a minimum and that suitable gloves be used in an occupational setting.
- 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 vapors 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. Swelling of the lungs can occur, either immediately or after a delay; symptoms of this include chest tightness, shortness of breath, frothy phlegm and cyanosis. Lack of oxygen can cause death hours after onset.
- The severity of effects of exposure to boron trifluoride depend on concentration and duration. Inhalation causes irritation of the throat, coughing and laboured breathing. A concentration of 50 ppm for 30 to 60 minutes can cause fatal massive inflammation and congestion of the lungs.
- 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. Pre-existing respiratory conditions such as emphysema, bronchitis may be aggravated by exposure. Occupational asthma may result from exposure.
- 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. Hydrogen fluoride has a strong irritating odor that is discernible at concentrations of about 0.04 ppm. Higher concentrations of the vapour/ mist may cause corrosion of the throat, nose and lungs, leading to severe inflammation, pulmonary oedema or possible hypocalcaemia.

Vapour concentration of 10 ppm is regarded as intolerable but a vapour concentration of 30 ppm. is considered by NIOSH as: Immediately Dangerous to Life and Health (IDLH).

In humans, inhalation of hydrogen fluoride gas may cause immediate or delayed-onset pulmonary oedema after a 1-hour exposure. In addition, exposure to high concentrations of the vapors of hydrofluoric acid characteristically results in ulcerative tracheobronchitis and haemorrhagic pulmonary edema; this local reaction is equivalent to that caused by gaseous hydrogen chloride. From accidental, occupational, and volunteer exposures, it is estimated that the lowest lethal concentration for a 5-minute human exposure to hydrogen fluoride is in the range of 50 to 250 ppm. Significant exposures by dermal or inhalation route may cause hypocalcaemia and

hypomagnesaemia; cardiac arrhythmias may follow. Acute renal failure has also been documented after an ultimately fatal inhalation exposure

Fluorides are not bound to any extent to plasma proteins. In human serum the fluoride occurs equally as nonionic and ionic forms. when fluoride intake is high the ionic form predominates.

Repeated sublethal exposures to hydrogen fluoride produce liver and kidney damage.

Rats, rabbits, guinea pigs, and dogs subject to hydrogen fluoride inhalation experienced significant irritation of the conjunctivae, nasal tissues, and respiratory system after acute inhalation exposures at near-lethal levels. Pathological lesions were observed in the kidney and liver, and the severity of the lesions was dose related. The external nares and nasal vestibules were black, and, at dosages causing considerable mortality, those areas showed zones of mucosal and submucosal necrosis.

CHRONIC HEALTH EFFECTS

• 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.

Limited evidence suggests that repeated or long-term occupational exposure may produce cumulative health effects involving organs or biochemical systems.

Boron trifluoride fumes strongly (dense white mist) in moist air to form corrosive hydrogen fluoride, fluoboric acid and boric acid. The same corrosive substances are produced on contact with the human body. The kidneys are a target organ. The chronic effects are unknown.

Repeated overexposure may cause dryness of the nasal membranes, nosebleed, dental fluorosis, asthma and chemical pneumonitis.

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 anemia 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. Prolonged ingestion causes effects to the reproductive system in both males and females.

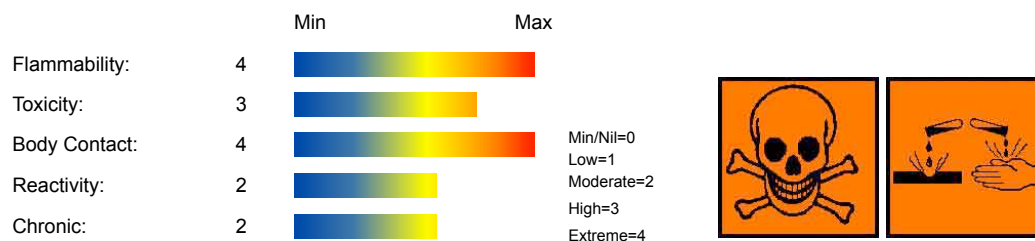
Extended exposure to inorganic fluorides causes fluorosis, which includes signs of joint pain and stiffness, tooth discoloration, nausea and vomiting, loss of appetite, diarrhea or constipation, weight loss, anemia, weakness and general unwellness. There may also be frequent urination and thirst. Redness, 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 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.

Fluoborates 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.

Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

HAZARD RATINGS



NAME	CAS RN	%
boron trifluoride diethyl etherate	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 Center 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.
- Observe the patient carefully.
- Never give liquid to a person showing signs of being sleepy or with reduced awareness; i.e. becoming unconscious.
- Give water to rinse out mouth, then provide liquid slowly and as much as casualty can comfortably drink.

- Transport to hospital or doctor without delay.

EYE

- If this product comes in contact with the eyes:
- 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 Center or a doctor, or for at least 15 minutes.
- Transport to hospital or doctor without delay.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

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 Center.
- 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.
- Transport to hospital, or doctor, without delay.

Inhalation of vapors or aerosols (mists, fumes) may cause lung edema. Corrosive substances may cause lung damage (e.g. lung edema, 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. This must definitely be left to a doctor or person authorized by him/her. (ICSC13719).

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 characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

- Immediate dilution (milk or water) within 30 minutes post ingestion is recommended.
- DO NOT attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
- Be careful to avoid further vomit since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
- Charcoal has no place in acid management.
- Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

- Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

- Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. DO NOT use neutralizing agents or any other additives. Several liters of saline are required.
- Cycloplegic drops, (1% cyclopentolate for short-term use or 5% homatropine for longer term use) antibiotic drops, vasoconstrictive agents or artificial tears may be indicated dependent on the severity of the injury.
- Steroid eye drops should only be administered with the approval of a consulting ophthalmologist).

[Ellenhorn and Barceloux: Medical Toxicology].

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.
- Where evidence of hypocalcemic or normocalcemic tetany exists, calcium gluconate (10 ml of a 10% solution) is injected to avoid tachycardia.

BIOLOGICAL EXPOSURE INDEX - BEI These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
Fluorides in urine	3 mg/gm creatinine	Prior to shift	B, NS
	10mg/gm creatinine	End of shift	B, NS

B: Background levels occur in specimens collected from subjects NOT exposed

NS: Non-specific determinant; also observed after exposure to other exposures.

Section 5 - FIRE FIGHTING MEASURES

Vapor Pressure (mmHg):	4.2 @ 20 C
Upper Explosive Limit (%):	36
Specific Gravity (water=1):	1.154
Lower Explosive Limit (%):	1.9

EXTINGUISHING MEDIA

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- DO NOT use water.

FIRE FIGHTING

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- Alert Emergency Responders 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.
- Consider evacuation.
- DO NOT use water on fires.
- Avoid spraying water onto liquid pools.
- Do not approach containers suspected to be hot.
- If safe to do so, remove containers from path of fire.
- Equipment should be thoroughly decontaminated after use.

GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS

• 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 rigid containers.
- May emit corrosive fumes.

FIRE INCOMPATIBILITY

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

PERSONAL PROTECTION

Glasses:

Chemical goggles.

Full face- shield.

Gloves:

Respirator:

Type BAX-P Filter of sufficient capacity

Section 6 - ACCIDENTAL RELEASE MEASURES

MINOR SPILLS

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- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.
- 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

• Chemical Class: acid compounds, organic

For release onto land: recommended sorbents listed in order of priority.

SORBENT TYPE	RANK	APPLICATION	COLLECTION	LIMITATIONS
LAND SPILL - SMALL				
wood fiber - pillow	1	throw	pitchfork	R, P, DGC, RT
cross-linked polymer - particulate	1	shovel	shovel	R,W,SS

cross-linked polymer - pillow	1	throw	pitchfork	R, DGC, RT
sorbent clay - particulate	2	shovel	shovel	R, I, P
foamed glass - pillow	2	throw	pitchfork	R, P, DGC, RT
wood fiber - particulate	3	shovel	shovel	R, W, P, DGC
LAND SPILL - MEDIUM				
cross-linked polymer -particulate	1	blower	skiploader	R, W, SS
polypropylene - particulate	2	blower	skiploader	W, SS, DGC
sorbent clay - particulate	2	blower	skiploader	R, I, P
cross-linked polymer - pillow	3	throw	skiploader	R, DGC, RT
polypropylene - mat	3	throw	skiploader	W, SS, DGC
expanded mineral - particulate	3	blower	skiploader	R, I, W, P, DGC

Legend

DGC: Not effective where ground cover is dense

R; Not reusable

I: Not incinerable

P: Effectiveness reduced when rainy

RT: Not effective where terrain is rugged

SS: Not for use within environmentally sensitive sites

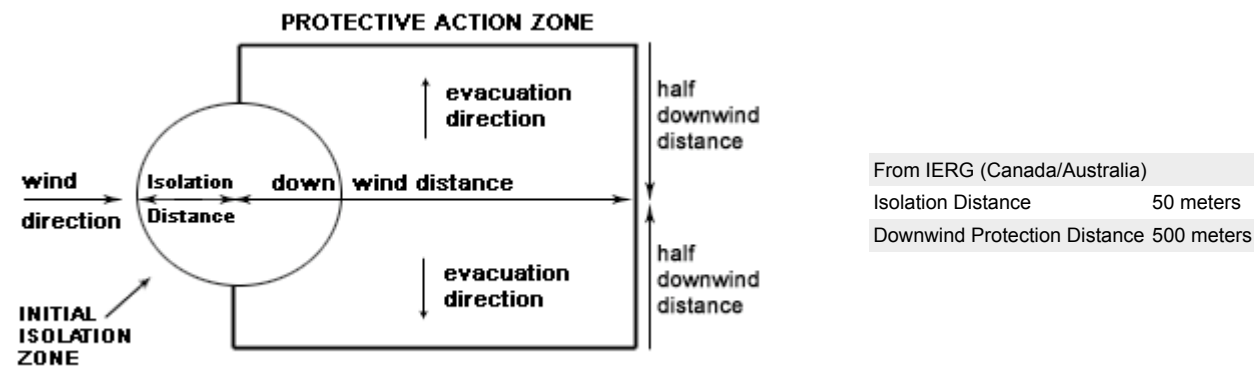
W: Effectiveness reduced when windy

Reference: Sorbents for Liquid Hazardous Substance Cleanup and Control;

R.W Melvold et al: Pollution Technology Review No. 150: Noyes Data Corporation 1988.

- Clear area of personnel and move upwind.
- Alert Emergency Responders and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water course.
- No smoking, naked lights or ignition sources. Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse / absorb vapor.
- Contain spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable product into labeled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

PROTECTIVE ACTIONS FOR SPILL



FOOTNOTES

1 PROTECTIVE ACTION ZONE is defined as the area in which people are at risk of harmful exposure. This zone assumes that random changes in wind direction confines the vapour plume to an area within 30 degrees on either side of the predominant wind direction, resulting in a crosswind protective action distance equal to the downwind protective action distance.

2 PROTECTIVE ACTIONS should be initiated to the extent possible, beginning with those closest to the spill and working away from the site in the downwind direction. Within the protective action zone a level of vapour concentration may exist resulting in nearly all unprotected persons becoming incapacitated and unable to take protective action and/or incurring serious or irreversible health effects.

3 INITIAL ISOLATION ZONE is determined as an area, including upwind of the incident, within which a high probability of localised wind reversal may expose nearly all persons without appropriate protection to life-threatening concentrations of the material.

4 SMALL SPILLS involve a leaking package of 200 litres (55 US gallons) or less, such as a drum (jerrican or box with inner containers). Larger packages leaking less than 200 litres and compressed gas leaking from a small cylinder are also considered "small spills". LARGE SPILLS involve many small leaking packages or a leaking package of greater than 200 litres, such as a cargo tank, portable tank or a "one-tonne" compressed gas cylinder.

5 Guide 132 is taken from the US DOT emergency response guide book.

ACUTE EXPOSURE GUIDELINE LEVELS (AEGL) (in ppm)

hydrofluor					
ic acid					
AEGL Type	10 min	30 min	60 min	4 hr	8 hr
AEGL 1	1	1	1	1	GALSYN~
AEGL 2	95	34	24	12	GALSYN~
AEGL 3	170	62	44	22	GALSYN~

AEGL 1: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience notable discomfort, irritation, or certain asymptomatic nonsensory effects. However, the effects are not disabling and are transient and reversible upon cessation of exposure.

AEGL 2: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience irreversible or other serious, long-lasting adverse health effects or an impaired ability to escape.

AEGL 3: The airborne concentration of a substance above which it is predicted that the general population, including susceptible individuals, could experience life-threatening health effects or death.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING

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- 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.
- Avoid smoking, naked lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Launder contaminated clothing before re-use.
- Use good occupational work practice.
- Observe manufacturer's storing and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.
- Containers, even those that have been emptied, may contain explosive vapors.
- Do NOT cut, drill, grind, weld or perform similar operations on or near containers.

RECOMMENDED STORAGE METHODS

-
- 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).

- Check that containers are clearly labelled and free from leaks.

DO NOT use aluminum or galvanized containers.

For low viscosity materials

- Drums and jerrycans 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.

For materials with a viscosity of at least 2680 cSt. (23 deg. C) and solids (between 15 C deg. and 40 deg C.):

- Removable head packaging;
- Cans with friction closures and
- low pressure tubes and cartridges may be used.

- Where combination packages are used, and the inner packages are of glass, porcelain or stoneware, there must be sufficient inert cushioning material in contact with inner and outer packages unless the outer packaging is a close fitting molded plastic box and the substances are not incompatible with the plastic. Check regularly for spills and leaks.

- Material is corrosive to most metals, glass and other siliceous materials.

STORAGE REQUIREMENTS

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- 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.
- Protect containers against physical damage and check regularly for leaks.
- Storage areas should be clearly identified, well illuminated, clear of obstruction and accessible only to trained and authorised personnel - adequate security must be provided so that unauthorised personnel do not have access.
- Store in grounded, properly designed and approved vessels and away from incompatible materials
- Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances.
- Use non-sparking ventilation systems, approved explosion proof equipment and intrinsically safe electrical systems.
- Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers - dry chemical, foam or carbon dioxide) and flammable gas detectors.
- Keep adsorbents for leaks and spills readily available
- For bulk storages, consider use of floating roof or nitrogen blanketed vessels; where venting to atmosphere is possible, equip storage tank vents with flame arrestors; inspect tank vents during winter conditions for vapour/ ice build-up; storage tanks should be above ground and diked to hold entire contents
- Observe manufacturer's storing and handling recommendations.

SAFE STORAGE WITH OTHER CLASSIFIED CHEMICALS



X: Must not be stored together

O: May be stored together with specific preventions

+: May be stored together

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

Source	Material	TWA ppm	TWA mg/m³	STEL ppm	STEL mg/m³	Peak ppm	Peak mg/m³	TWA F/CC	Notes
US - Hawaii Air Contaminant Limits	boron trifluoride diethyl etherate (Fluorides (as F))		2.5						(CAS (Varies with compound))
Canada - Alberta Occupational Exposure Limits	diethyl ether (Diethyl ether (Ethyl ether))	400	1210	500	1520				
Canada - British Columbia Occupational Exposure Limits	diethyl ether (Ethyl ether)	400		500					2B
Canada - Ontario Occupational Exposure Limits	diethyl ether (Ethoxyethane)	400	1,210	500	1,515				
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	diethyl ether (Diethyl ether)	400	1210	500	1520				
US OSHA Permissible Exposure Levels (PELs) - Table Z1	diethyl ether (Ethyl ether)	400	1200						
US ACGIH Threshold Limit Values (TLV)	diethyl ether (Ethyl ether)	400		500					TLV Basis: central nervous system impairment; upper respiratory tract irritation
US - Minnesota Permissible Exposure Limits (PELs)	diethyl ether (Ethyl ether)	400	1200	500	1500				
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	diethyl ether (Ethyl ether)	400	1200	500	1500				
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	diethyl ether (Ethyl ether)	400	1200						

US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	diethyl ether (Ethyl ether)	400	1200	500	1500	
US - California Permissible Exposure Limits for Chemical Contaminants	diethyl ether (Ethyl ether)	400	1,200	500	1500	
US - Idaho - Limits for Air Contaminants	diethyl ether (Ethyl ether)	400	1200			
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	diethyl ether (Ethyl ether)	400		500		
US - Hawaii Air Contaminant Limits	diethyl ether (Ethyl ether)	400	1,200	500	1,500	
US - Alaska Limits for Air Contaminants	diethyl ether (Ethyl ether)	400	1200	500	1500	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	diethyl ether (Diethyl ether, see Ethyl ether)	400	1,200	500	1,500	
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	diethyl ether (Ethyl ether)	400	1,200	500	1,500	
US - Washington Permissible exposure limits of air contaminants	diethyl ether (Diethyl ether (Ethyl ether))	400		500		
US - Michigan Exposure Limits for Air Contaminants	diethyl ether (Ethyl ether)	400	1200		500	1500
Canada - Nova Scotia Occupational Exposure Limits	diethyl ether (Ethyl ether)	400		500		TLV Basis: central nervous system impairment; upper respiratory tract irritation
Canada - Prince Edward Island Occupational Exposure Limits	diethyl ether (Ethyl ether)	400		500		TLV Basis: central nervous system impairment; upper respiratory tract irritation
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	diethyl ether (Ethyl ether)	400	1200			
US - Oregon Permissible Exposure Limits (Z1)	diethyl ether (Ethyl ether)	400	1,200			
Canada - Northwest Territories Occupational Exposure Limits (English)	diethyl ether (Diethyl ether (Ethyl ether))	400	1213	500	1516	
Canada - Northwest Territories Occupational Exposure Limits (English)	diethyl ether (Ethyl ether)	400	1213	500	1516	
Canada - Alberta Occupational Exposure Limits	boron trifluoride (Boron trifluoride)					1 2.8
Canada - Ontario Occupational Exposure Limits	boron trifluoride (Boron trifluoride)					1 2.8
US NIOSH Recommended Exposure Limits (RELs)	boron trifluoride (Boron trifluoride)					1 3
US OSHA Permissible Exposure Levels (PELs) - Table Z1	boron trifluoride (Boron trifluoride)					1 3
US ACGIH Threshold Limit Values (TLV)	boron trifluoride (Boron trifluoride)					1 TLV Basis: lower respiratory tract irritation; pneumonitis
US - Minnesota Permissible Exposure Limits (PELs)	boron trifluoride (Boron trifluoride)					1 3
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	boron trifluoride (Boron trifluoride)	(C)1	(C)3			

US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	boron trifluoride (Boron trifluoride)	1	3				
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	boron trifluoride (Boron trifluoride)	1	3				
US - California Permissible Exposure Limits for Chemical Contaminants	boron trifluoride (Boron trifluoride)	1	3				
US - Idaho - Limits for Air Contaminants	boron trifluoride (Boron trifluoride)	1	3				
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	boron trifluoride (Boron trifluoride)	1	2,8				
US - Hawaii Air Contaminant Limits	boron trifluoride (Boron trifluoride)	1	3				
US - Alaska Limits for Air Contaminants	boron trifluoride (Boron trifluoride)	1	3				
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	boron trifluoride (Boron trifluoride)	1					
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	boron trifluoride (Boron trifluoride)	1	3	-	-		
US - Washington Permissible exposure limits of air contaminants	boron trifluoride (Boron trifluoride)	1					
US - Michigan Exposure Limits for Air Contaminants	boron trifluoride (Boron trifluoride)	1	3				
Canada - Prince Edward Island Occupational Exposure Limits	boron trifluoride (Boron trifluoride)	1					TLV Basis: lower respiratory tract irritation; pneumonitis
US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants	boron trifluoride (Boron trifluoride)	1	3				
Canada - Nova Scotia Occupational Exposure Limits	boron trifluoride (Boron trifluoride)	1					TLV Basis: lower respiratory tract irritation; pneumonitis
US - Oregon Permissible Exposure Limits (Z1)	boron trifluoride (Boron trifluoride)	1	3				
Canada - Northwest Territories Occupational Exposure Limits (English)	boron trifluoride (Boron trifluoride)	1	2.8				
US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	boron trifluoride (Fluoride as dust (Z37.28-1969))		2.5				
US OSHA Permissible Exposure Levels (PELs) - Table Z2	boron trifluoride (Fluoride as dust (Z37.28-1969))		2.5				
US - Oregon Permissible Exposure Limits (Z2)	boron trifluoride (Fluoride as dust (Z37.28-1969))		2.5				
US - Minnesota Permissible Exposure Limits (PELs)	hydrofluoric acid (Hydrogen fluoride (as F))	3		6			
Canada - Ontario Occupational Exposure Limits	hydrofluoric acid (Hydrogen fluoride (as F))	0.5			2		
US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)	hydrofluoric acid (HYDROGEN FLUORIDE)	0.02					
US NIOSH Recommended Exposure Limits (RELs)	hydrofluoric acid (Hydrogen fluoride)	3	2.5		6	5	

US ACGIH Threshold Limit Values (TLV)	hydrofluoric acid (Hydrogen fluoride)	0.5			2		Measured as F. TLV Basis: upper and lower respiratory tract, skin & eye irritation; fluorosis
Canada - British Columbia Occupational Exposure Limits	hydrofluoric acid (Hydrogen fluoride, as F)				2		
Canada - Alberta Occupational Exposure Limits	hydrofluoric acid (Hydrogen fluoride, as F)	0.5	0.4		2	1.6	
US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants	hydrofluoric acid (Hydrogen fluoride (as F))	3		6			
US - Idaho - Acceptable Maximum Peak Concentrations	hydrofluoric acid (Hydrogen Fluoride (Z37.26-1969))	3					
US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants	hydrofluoric acid (Hydrogen fluoride (as F))	3		6			
US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants	hydrofluoric acid (Hydrogen fluoride (as F))			See Table Z-2			
US - Idaho - Limits for Air Contaminants	hydrofluoric acid (Hydrogen fluoride (as F))			[2]			
US - California Permissible Exposure Limits for Chemical Contaminants	hydrofluoric acid (Hydrogen fluoride, as F)	3	2.5	6			
US - Michigan Exposure Limits for Air Contaminants	hydrofluoric acid (Hydrogen fluoride (as F))	3		6			
US - Alaska Limits for Air Contaminants	hydrofluoric acid (Hydrogen fluoride (as F))	3		6			
Canada - Northwest Territories Occupational Exposure Limits (English)	hydrofluoric acid (Hydrogen fluoride (as F))	3	2.5	6	4.9		
US - Washington Permissible exposure limits of air contaminants	hydrofluoric acid (Hydrogen fluoride)				3		
Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances	hydrofluoric acid (Hydrogen fluoride)	3	2	3	2		
US - Hawaii Air Contaminant Limits	hydrofluoric acid (Hydrogen fluoride (as F))	3		6			
Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits	hydrofluoric acid (Hydrogen fluoride, (as F))	0.5					
Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)	hydrofluoric acid (Hydrogen fluoride (as F))				3	2.6	
US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift	hydrofluoric acid (Hydrogen fluoride (Z37.28-1969))	3					
Canada - Nova Scotia Occupational Exposure Limits	hydrofluoric acid (Hydrogen fluoride)	0.5			2		Measured as F. TLV Basis: upper and lower respiratory tract, skin & eye irritation; fluorosis
US - Oregon Permissible Exposure Limits (Z2)	hydrofluoric acid (Hydrogen fluoride (Z37.28-1969))	3					

Canada - Prince Edward Island Occupational Exposure Limits	hydrofluoric acid (Hydrogen fluoride)	0.5	2	Measured as F. TLV Basis: upper and lower respiratory tract, skin & eye irritation; fluorosis
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EMERGENCY EXPOSURE LIMITS

Material	Revised IDLH Value (mg/m3)	Revised IDLH Value (ppm)
diethyl ether		1,900 [LEL]
boron trifluoride		25
hydrofluoric acid		30 [Unch]

NOTES

Values marked LEL indicate that the IDLH was based on 10% of the lower explosive limit for safety considerations even though the relevant toxicological data indicated that irreversible health effects or impairment of escape existed only at higher concentrations.

MATERIAL DATA

BORON TRIFLUORIDE DIETHYL ETHERATE:

BORON TRIFLUORIDE:

DIETHYL ETHER:

HYDROFLUORIC ACID:

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

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

The Odor Safety Factor (OSF) is defined as:

OSF = Exposure Standard (TWA) ppm / Odor 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	Idem for 50-90% of persons being distracted
C	1-26	Idem for less than 50% of persons being distracted
D	0.18-1	0-50% of persons aware of being tested perceive by smell that the Exposure Standard is being reached
E	<0.18	Idem for less than 10% of persons aware of being tested

Amoore and Hautala * have determined that it is only at an OSF value of 26 that 50% of distracted persons can detect the substance at the Exposure Standard value. In the case of alerted persons, an OSF of 26 means that 99% of them can detect the odor at the Exposure Standard value. It is ONLY for substances belonging to Class A and B that there is a reasonable chance of being warned in time, that the Exposure Standard is being exceeded. * Journal Applied Toxicology: Vol 3, 1983, p272

NOTE: The use of the OSF may be inappropriate for mixtures where substances mask the odor of others.

BORON TRIFLUORIDE DIETHYL ETHERATE:

BORON TRIFLUORIDE:

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. The recommendation for TLV-TWA is based on the results of controlled inhalation studies in human volunteers. The limit is thought to minimise the potential for occurrence of dental and/or osteofluorosis (systemic fluorosis) and to prevent the risk of primary irritation to the eyes, nose, throat and lower respiration system.

At concentrations exceeding 3 ppm there have been reports of skin reddening and burning of the nose and eyes.

Odour Safety Factor(OSF)

OSF=71 (HYDROGEN FLUORIDE).

BORON TRIFLUORIDE DIETHYL ETHERATE:

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. Disagreement exists amongst peak bodies (notably NIOSH) as to whether this limit limits sensory limitation.

Odour Safety Factor (OSF)

OSF=45 (ETHYL ETHER).

BORON TRIFLUORIDE DIETHYL ETHERATE:

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 insufficient as a warning of overexposure, because the odour is not unpleasant.

Odour Safety Factor(OSF)

OSF=71 (boron trifluoride).

BORON TRIFLUORIDE DIETHYL ETHERATE:

• 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. A short-term duration exposure value has not been recommended, because no quantitative data as to the levels of hydroquinone which produce eye irritation or more serious corneal changes has been identified.

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 insufficient as a warning of overexposure, because the odour is not unpleasant.

PERSONAL PROTECTION



Consult your EHS staff for recommendations

EYE

-
- Chemical goggles.
- Full face shield.
- Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

HANDS/FEET

- Elbow length PVC gloves.
 - When handling corrosive liquids, wear trousers or overalls outside of boots, to avoid spills entering boots.
- Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include: such as:
- frequency and duration of contact,
 - chemical resistance of glove material,
 - glove thickness and
 - dexterity

Select gloves tested to a relevant standard (e.g. Europe EN 374, US F739).

- When prolonged or frequently repeated contact may occur, a glove with a protection class of 5 or higher (breakthrough time greater than 240 minutes according to EN 374) is recommended.
- When only brief contact is expected, a glove with a protection class of 3 or higher (breakthrough time greater than 60 minutes according to EN 374) is recommended.
- Contaminated gloves should be replaced.

Gloves must only be worn on clean hands. After using gloves, hands should be washed and dried thoroughly. Application of a non-perfumed moisturiser is recommended.

- Neoprene gloves

OTHER

-
- Overalls.
- PVC Apron.
- PVC protective suit may be required if exposure severe.
- Eyewash unit.
- Ensure there is ready access to a safety shower.
- 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.

RESPIRATOR

• Selection of the Class and Type of respirator will depend upon the level of breathing zone contaminant and the chemical nature of the contaminant. Protection Factors (defined as the ratio of contaminant outside and inside the mask) may also be important.

Breathing Zone Level ppm (volume)	Maximum Protection Factor	Half-face Respirator	Full-Face Respirator
1000	10	BAX-1 P	-
1000	50	-	BAX-1 P
5000	50	Airline*	-

5000	100	-	BAX-2 P
10000	100	-	BAX-3 P
	100+		Airline* **

* - Continuous Flow ** - Continuous-flow or positive pressure demand.

The local concentration of material, quantity and conditions of use determine the type of personal protective equipment required.

Use appropriate NIOSH-certified respirator based on informed professional judgement. In conditions where no reasonable estimate of exposure can be made, assume the exposure is in a concentration IDLH and use NIOSH-certified full face pressure demand SCBA with a minimum service life of 30 minutes, or a combination full facepiece pressure demand SAR with auxiliary self-contained air supply. Respirators provided only for escape from IDLH atmospheres shall be NIOSH-certified for escape from the atmosphere in which they will be used.

ENGINEERING CONTROLS

• Local exhaust ventilation usually required. If risk of overexposure exists, wear an approved respirator. Correct fit is essential to obtain adequate protection an approved self contained breathing apparatus (SCBA) may be required in some situations. Provide adequate ventilation in warehouse or closed storage area.

Air contaminants generated in the workplace possess varying "escape" velocities which, in turn, determine the "capture velocities" of fresh circulating air required to effectively remove the contaminant.

Type of Contaminant:	Air Speed:
solvent, vapors, degreasing etc., evaporating from tank (in still air).	0.25-0.5 m/s (50-100 f/min.)
aerosols, fumes from pouring operations, intermittent container filling, low speed conveyer transfers, welding, spray drift, plating acid fumes, pickling (released at low velocity into zone of active generation)	0.5-1 m/s (100-200 f/min.)
direct spray, spray painting in shallow booths, drum filling, conveyer loading, crusher dusts, gas discharge (active generation into zone of rapid air motion)	1-2.5 m/s (200-500 f/min.)
grinding, abrasive blasting, tumbling, high speed wheel generated dusts (released at high initial velocity into zone of very high rapid air motion).	2.5-10 m/s (500-2000 f/min.)

Within each range the appropriate value depends on:

Lower end of the range	Upper end of the range
1: Room air currents minimal or favorable to capture	1: Disturbing room air currents
2: Contaminants of low toxicity or of nuisance value only.	2: Contaminants of high toxicity
3: Intermittent, low production.	3: High production, heavy use
4: Large hood or large air mass in motion	4: Small hood-local control only

Simple theory shows that air velocity falls rapidly with distance away from the opening of a simple extraction pipe. Velocity generally decreases with the square of distance from the extraction point (in simple cases). Therefore the air speed at the extraction point should be adjusted, accordingly, after reference to distance from the contaminating source. The air velocity at the extraction fan, for example, should be a minimum of 1-2 m/s (200-400 f/min) for extraction of solvents generated in a tank 2 meters distant from the extraction point. Other mechanical considerations, producing performance deficits within the extraction apparatus, make it essential that theoretical air velocities are multiplied by factors of 10 or more when extraction systems are installed or used.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL PROPERTIES

Liquid.

Corrosive.

Acid.

Toxic or noxious vapors/ gas.

State	Liquid	Molecular Weight	141.93
Melting Range (°F)	-72.4	Viscosity	Not Available
Boiling Range (°F)	258.8	Solubility in water (g/L)	Reacts
Flash Point (°F)	118.004	pH (1% solution)	Not available.
Decomposition Temp (°F)	Not Available	pH (as supplied)	Not applicable
Autoignition Temp (°F)	Not available	Vapor Pressure (mmHg)	4.2 @ 20 C
Upper Explosive Limit (%)	36	Specific Gravity (water=1)	1.154
Lower Explosive Limit (%)	1.9	Relative Vapor Density (air=1)	>1
Volatile Component (%vol)	100	Evaporation Rate	Not available

APPEARANCE

Colourless fuming liquid which hydrolyses immediately on contact with water.

Section 10 - CHEMICAL STABILITY

CONDITIONS CONTRIBUTING TO INSTABILITY

.

- Contact with alkaline material liberates heat

STORAGE INCOMPATIBILITY

• Boron trifluoride diethyl etherate:

- 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
- may be incompatible with glass and porcelain

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
- 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 oxidizing agents as violent reaction may occur, with spontaneous decomposition or explosion.

Segregate from alcohol, water.

- Avoid strong acids, bases.

Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Reacts with mild steel, galvanized steel / zinc producing hydrogen gas which may form an explosive mixture with air.

- NOTE: May develop pressure in containers; open carefully. Vent periodically.

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

Section 11 - TOXICOLOGICAL INFORMATION

boron trifluoride diethyl etherate

TOXICITY AND IRRITATION

• unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances.

• 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. Key criteria for the diagnosis of RADS include the absence of preceding respiratory disease, in a non-atopic individual, with abrupt onset of persistent asthma-like symptoms within minutes to hours of a documented exposure to the irritant. A reversible airflow pattern, on spirometry, with the presence of moderate to severe bronchial hyperreactivity on methacholine challenge testing and the lack of minimal lymphocytic inflammation, without eosinophilia, have also been included in the criteria for diagnosis of RADS. RADS (or asthma) following an irritating inhalation is an infrequent disorder with rates related to the concentration of and duration of exposure to the irritating substance. Industrial bronchitis, on the other hand, is a disorder that occurs as result of exposure due to high concentrations of irritating substance (often particulate in nature) and is completely reversible after exposure ceases. The disorder is characterised by dyspnea, cough and mucus production.

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

Anaesthetics, volatile	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
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Fluorides (inorganic, used in drinking-water)	International Agency for Research on Cancer (IARC) - Agents Reviewed by the IARC Monographs	Group	3
Fluorides (as F)	ND	Carcinogen Category	A4
SKIN			
diethyl ether	ND	Notes	Skin
diethyl ether	ND	Notation	Skin
diethyl ether	Canada - Alberta Occupational Exposure Limits - Skin	Substance Interaction	1
hydrofluoric acid	ND	Skin Designation	Yes

Section 12 - ECOLOGICAL INFORMATION

Refer to data for ingredients, which follows:

BORON TRIFLUORIDE:

HYDROFLUORIC ACID:

BORON TRIFLUORIDE DIETHYL ETHERATE:

• Although small amounts of fluorides are conceded to have beneficial effects two forms of chronic toxic effect, dental fluorosis and skeletal fluorosis may be caused by excessive intake over long periods.

HYDROFLUORIC ACID:

BORON TRIFLUORIDE DIETHYL ETHERATE:

• Prevent, by any means available, spillage from entering drains or watercourses.

DIETHYL ETHER:

BORON TRIFLUORIDE:

HYDROFLUORIC ACID:

BORON TRIFLUORIDE DIETHYL ETHERATE:

• DO NOT discharge into sewer or waterways.

BORON TRIFLUORIDE:

BORON TRIFLUORIDE DIETHYL ETHERATE:

• For boron and borates:

Environmental fate:

Boron is generally found in nature bound to oxygen and is never found as the free element. Atmospheric boron may be in the form of particulate matter or aerosols as borides, boron oxides, borates, boranes, organoboron compounds, trihalide boron compounds, or borazines. Borates are relatively soluble in water, and will probably be removed from the atmosphere by precipitation and dry deposition. The half-life of airborne particles is usually on the order of days, depending on the size of the particle and atmospheric conditions.

Boron readily hydrolyses in water to form the electrically neutral, weak monobasic acid boric acid (H_3BO_3) and the monovalent ion, $B(OH)_4^-$. In concentrated solutions, boron may polymerise, leading to the formation of complex and diverse molecular arrangements. Because most environmentally relevant boron minerals are highly soluble in water, it is unlikely that mineral equilibria will control the fate of boron in water. Boron was found to not be significantly removed during the conventional treatment of waste water. Boron may, however, be co-precipitated with aluminum, silicon, or iron to form hydroxyborate compounds on the surfaces of minerals.

Waterborne boron may be adsorbed by soils and sediments. Adsorption-desorption reactions are expected to be the only significant mechanism that will influence the fate of boron in water. The extent of boron adsorption depends on the pH of the water and the chemical composition of the soil. The greatest adsorption is generally observed at pH 7.5-9.0. the single most important property of soil that will influence the mobility of boron is the abundance of amorphous aluminum oxide. The extent of boron adsorption has also been attributed to the levels of iron oxide, and to a lesser extent, the organic matter present in the soil, although other studies found that the amount of organic matter present was not important. The adsorption of boron may not be reversible in some soils. The lack of reversibility may be the result of solid-phase formation on mineral surfaces and/or the slow release of boron by diffusion from the interior of clay minerals.

It is unlikely that boron is bioconcentrated significantly by organisms from water. A bioconcentration factor (BCF) relates the concentration of a chemical in the tissues of aquatic and terrestrial animals or plants to the concentration of the chemical in water or soil. The BCFs of boron in marine and freshwater plants, fish, and invertebrates were estimated to be <100. Experimentally measured BCFs for fish have ranged from 52 to 198. These BCFs suggest that boron is not significantly bioconcentrated.

As an element, boron itself cannot be degraded in the environment; however, it may undergo various reactions that change the form of boron (e.g., precipitation, polymerization, and acid-base reactions) depending on conditions such as its concentration in water and pH. In nature, boron is generally found in its oxygenated form. In aqueous solution, boron is normally present as boric acid and borate ions, with the dominant form of inorganic boron in natural aqueous systems as undissociated boric acid. Boric acid acts as an electron acceptor in aqueous solution, accepting a hydroxide ion from water to form $B(OH)_4^-$ -ion. In dilute solution, the favored form of boron is $B(OH)_4^-$. In more concentrated solutions (>0.1 M boric acid) and at neutral to alkaline pH (6– 11), polymeric species are formed (e.g., $B_3O_3(OH)_4^-$, $B_5O_6(OH)_4^-$, $B_3O_3(OH)_5^{2-}$, and $B_4O_5(OH)_4^{2-}$).

Most boron compounds are transformed to borates in soil due to the presence of moisture. Borates themselves are not further degraded in soil. However, borates can exist in a variety of forms in soil. Borates are removed from soils by water leaching and by assimilation by plants.

The most appreciable boron exposure to the general population is likely to be ingestion of food and to a lesser extent in water. As boron is a natural component of the environment, individuals will have some exposure from foods and drinking water.

Boron-containing salts (borates) are ubiquitous in the environment. Surface soil, unpolluted waterways and seawater all typically contain significant amounts of boron as borate. Boron is an essential micronutrient for healthy growth of plants, however, it can be harmful to boron sensitive plants in higher quantities. In some areas such as the American Southwest, boron occurs naturally in surface waters in concentrations that have been shown to be toxic to commercially important plants.

Based on the collected information regarding aquatic toxicity, boron is not regarded as dangerous to aquatic organisms. The concentration in treated municipal waste water is a factor 100 lower than the NOEC-value for *Daphnia magna*.

No quality criteria exist for the concentration of boron in soil and compost. Boron is added to farmland when sewage sludge is applied as a soil improving agent, but there is not sufficient data to evaluate its effect on soil organisms. Being an essential micro-nutrient, no adverse effects of boron are expected at low concentrations.

Ecotoxicity:

In aquatic environments low concentrations of borates generally promote the growth of algae, whereas higher concentrations inhibited algal growth. In a growth inhibition test with *Scenedesmus subspicatus*, an EC50 value of 34 mg B/l was determined. Boric acid toxicity in *Daphnia* 48 h-LC50 (static test) was found to be 95 mg B/l. In a separate study it was concluded that chronic effects of boron to *Daphnia* may occur at a concentration of > 10 mg/l.

The toxicity of boron in fish is often higher in soft water than in hard water. The acute toxicity of boron towards *Danio rerio* (96 h-LC50) has been determined to 14.2 mg B/l. In a fish early life stage test with rainbow trout NOEC levels of boron have been determined in the range between 0.009 and 0.103 mg B/l, whereas the EC50 ranged from 27 to 100 mg B/l dependent on the water hardness.

BORON TRIFLUORIDE DIETHYL ETHERATE:

DIETHYL ETHER:

• log Kow (Sangster 1997):	0.89
• Fish LC50 (96hr.) (mg/l):	10000
• log Pow (Verschuereen 1983):	0.77/0.83
• BOD5:	0.03
• ThOD:	2.6

• Harmful to aquatic organisms.

• Most ethers are very resistant to hydrolysis, and the rate of cleavage of the carbon-oxygen bond by abiotic processes is expected to be insignificant.

Direct photolysis will not be an important removal process since aliphatic ethers do not absorb light at wavelengths >290 nm.

log Kow: 0.77-0.89

Koc: 11-73

Half-life (hr) air: 29

Half-life (hr) H2O surface water: 3.1-36

Henry's atm m³ /mol: 0.00128

BOD 5: 0.03

ThOD: 2.6

BCF: 1.3-2.8

Fish LD50 (24 h): 7000 mg/L

Bioaccumulation: unlikely

processes Abiotic: photox,RxnOH*

BORON TRIFLUORIDE:

Fish Toxicity: 15000000ug/L 24 hours LC50 (Mortality)

Bluegill (*Lepomis macrochirus*) [Matheson]

HYDROFLUORIC ACID:

Ecotoxicity

Ingredient	Persistence: Water/Soil	Persistence: Air	Bioaccumulation	Mobility
diethyl ether	LOW		LOW	HIGH
hydrofluoric acid			LOW	

Section 13 - DISPOSAL CONSIDERATIONS

US EPA Waste Number & Descriptions

A. General Product Information

Ignitability characteristic: use EPA hazardous waste number D001 (waste code I)

Corrosivity characteristic: use EPA hazardous waste number D002 (waste code C)

B. Component Waste Numbers

When diethyl ether is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U117 (waste code I).

When hydrofluoric acid is present as a solid waste as a discarded commercial chemical product, off-specification species, as a container residue, or a spill residue, use EPA waste number U134 (waste code C,T).

Disposal Instructions

All waste must be handled in accordance with local, state and federal regulations.

• Puncture containers to prevent re-use and bury at an authorized landfill.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

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

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. If it has been contaminated, it may be possible to reclaim the product by filtration, distillation or some other means. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate.

DO NOT allow wash water from cleaning equipment to enter drains. Collect all wash water for treatment before disposal.

- Recycle wherever possible.
- Consult manufacturer for recycling options or consult Waste Management Authority for disposal if no suitable treatment or disposal facility can be identified.
- Treat and neutralize at an approved treatment plant. Treatment should involve: Neutralization with soda-ash or soda-lime followed by:

- Burial in a licensed land-fill or Incineration in a licensed 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



DOT:

Symbols:	None	Hazard class or Division:	8
Identification Numbers:	UN2604	PG:	I
Label Codes:	8, 3	Special provisions:	A3, A19, T10, TP2
Packaging: Exceptions:	None	Packaging: Non-bulk:	201
Packaging: Exceptions:	None	Quantity limitations: Passenger aircraft/rail:	0.5 L
Quantity Limitations: Cargo aircraft only:	2.5 L	Vessel stowage: Location:	D
Vessel stowage: Other:	40		

Hazardous materials descriptions and proper shipping names:

Boron trifluoride diethyl etherate

Air Transport IATA:

ICAO/IATA Class:	8 (3)	ICAO/IATA Subrisk:	None
UN/ID Number:	2604	Packing Group:	I
Special provisions:	None		

Shipping Name: BORON TRIFLUORIDE DIETHYL ETHERATE

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:	None		

Shipping Name: BORON TRIFLUORIDE DIETHYL ETHERATE

Section 15 - REGULATORY INFORMATION

boron trifluoride diethyl etherate (CAS: 109-63-7) is found on the following regulatory lists;

"Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)", "US - Massachusetts Oil & Hazardous Material List", "US - New Jersey Right to Know Hazardous Substances", "US - Pennsylvania - Hazardous Substance List", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US Toxic Substances Control Act (TSCA) - Inventory"

Regulations for ingredients

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

"Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Industrial Hazardous Substances", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Controlled Drugs and Substances Act Schedule VI", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)", "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", "International Council of Chemical Associations (ICCA) - High Production Volume List", "OECD Representative List of High Production Volume (HPV) Chemicals", "United Nations List of Precursors and Chemicals Frequently used in the Illicit Manufacture of Narcotic Drugs and Psychotropic Substances Under International Control - Table II", "US - Alaska Limits for Air Contaminants", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Permissible Exposure Limits (Z1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational

Exposure Limits - Limits For Air Contaminants", "US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Discarded Chemical Products List - ""U"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US CERCLA Priority List of Hazardous Substances", "US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US Drug Enforcement Administration (DEA) List I and II Regulated Chemicals", "US EPA High Production Volume Program Chemical List", "US EPA Master Testing List - Index I Chemicals Listed", "US EPA Master Testing List - Index II Chemicals Removed", "US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US RCRA (Resource Conservation & Recovery Act) - Phase 4 LDR Rule - Universal Treatment Standards", "US Toxic Substances Control Act (TSCA) - Inventory", "US TSCA Section 4/12 (b) - Sunset Date/Status", "US TSCA Section 8 (a) - Preliminary Assessment Information Rules (PAIR) - Reporting List", "US TSCA Section 8 (d) - Health and Safety Data Reporting", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

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

"Canada - Alberta Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Industrial Hazardous Substances", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)", "OECD Representative List of High Production Volume (HPV) Chemicals", "US - Alaska Limits for Air Contaminants", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Hazardous Materials", "US - Oregon Permissible Exposure Limits (Z1)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming List of Highly Hazardous Chemicals, Toxics and Reactives", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US ACGIH Threshold Limit Values (TLV)", "US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US DOE Temporary Emergency Exposure Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AELs) - Interim", "US EPCRA Section 313 Chemical List", "US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act", "US NFPA 45 Fire Protection for Laboratories Using Chemicals - Flammability Characteristics of Common Compressed and Liquefied Gases", "US NIOSH Recommended Exposure Limits (RELs)", "US OSHA List of Highly Hazardous Chemicals, Toxics and Reactives", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US SARA Section 302 Extremely Hazardous Substances", "US Toxic Substances Control Act (TSCA) - Inventory", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

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

"Canada - Alberta Ambient Air Quality Objectives", "Canada - Alberta Occupational Exposure Limits", "Canada - British Columbia Occupational Exposure Limits", "Canada - Northwest Territories Occupational Exposure Limits (English)", "Canada - Nova Scotia Occupational Exposure Limits", "Canada - Ontario Occupational Exposure Limits", "Canada - Prince Edward Island Occupational Exposure Limits", "Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)", "Canada - Saskatchewan Occupational Health and Safety Regulations - Contamination Limits", "Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances", "Canada Domestic Substances List (DSL)", "Canada Environmental Quality Guidelines (EQGs) Air", "Canada Ingredient Disclosure List (SOR/88-64)", "Canada National Pollutant Release Inventory (NPRI)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (English)", "Canada Toxicological Index Service - Workplace Hazardous Materials Information System - WHMIS (French)", "OECD Representative List of High Production Volume (HPV) Chemicals", "The Australia Group Export Control List: Chemical Weapons Precursors", "US - Alaska Limits for Air Contaminants", "US - California Air Toxics ""Hot Spots"" List (Assembly Bill 2588) Substances for which emissions must be quantified", "US - California Occupational Safety and Health Regulations (CAL/OSHA) - Hazardous Substances List", "US - California OEHHA/ARB - Acute Reference Exposure Levels and Target Organs (RELs)", "US - California OEHHA/ARB - Chronic Reference Exposure Levels and Target Organs (CRELs)", "US - California Permissible Exposure Limits for Chemical Contaminants", "US - California Toxic Air Contaminant List Category II", "US - Connecticut Hazardous Air Pollutants", "US - Hawaii Air Contaminant Limits", "US - Idaho - Acceptable Maximum Peak Concentrations", "US - Idaho - Limits for Air Contaminants", "US - Massachusetts Oil & Hazardous Material List", "US - Michigan Exposure Limits for Air Contaminants", "US - Minnesota Hazardous Substance List", "US - Minnesota Permissible Exposure Limits (PELs)", "US - New Jersey Right to Know Hazardous Substances", "US - Oregon Hazardous Materials", "US - Oregon Permissible Exposure Limits (Z1)", "US - Oregon Permissible Exposure Limits (Z2)", "US - Pennsylvania - Hazardous Substance List", "US - Rhode Island Hazardous Substance List", "US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants", "US - Vermont Hazardous Constituents", "US - Vermont Hazardous wastes which are Discarded Commercial Chemical Products or Off-Specification Batches of Commercial Chemical Products or Spill Residues of Either", "US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants", "US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants", "US - Washington Dangerous waste constituents list", "US - Washington Discarded Chemical Products List - ""U"" Chemical Products", "US - Washington Permissible exposure limits of air contaminants", "US - Wyoming List of Highly Hazardous Chemicals, Toxics and Reactives", "US - Wyoming Toxic and Hazardous Substances Table Z1 Limits for Air Contaminants", "US - Wyoming Toxic and Hazardous Substances Table Z-2 Acceptable ceiling concentration, Acceptable maximum peak above the acceptable ceiling concentration for an 8-hr shift", "US ACGIH Threshold Limit Values (TLV)", "US ATSDR Minimal Risk Levels for Hazardous Substances (MRLs)", "US CERCLA Priority List of Hazardous Substances", "US Clean Air Act - Hazardous Air Pollutants", "US CWA (Clean Water Act) - List of Hazardous Substances", "US CWA (Clean Water Act) - Reportable Quantities of Designated Hazardous Substances", "US Department of Homeland Security Chemical Facility Anti-Terrorism Standards - Chemicals of Interest", "US Department of Transportation (DOT) List of Hazardous Substances and Reportable Quantities - Hazardous Substances Other Than Radionuclides", "US DOE Temporary Emergency Exposure

Limits (TEELs)", "US EPA Acute Exposure Guideline Levels (AEGLs) - Final", "US EPA Master Testing List - Index I Chemicals Listed", "US EPCRA Section 313 Chemical List", "US FDA Indirect Food Additives: Adhesives and Components of Coatings - Substances for Use Only as Components of Adhesives - Adhesives", "US List of Lists - Consolidated List of Chemicals Subject to the Emergency Planning and Community Right-to-Know Act (EPCRA) and Section 112(r) of the Clean Air Act", "US NFPA 45 Fire Protection for Laboratories Using Chemicals - Flammability Characteristics of Common Compressed and Liquefied Gases", "US NIOSH Recommended Exposure Limits (RELs)", "US OSHA List of Highly Hazardous Chemicals, Toxics and Reactives", "US OSHA Permissible Exposure Levels (PELs) - Table Z1", "US OSHA Permissible Exposure Levels (PELs) - Table Z2", "US Postal Service (USPS) Hazardous Materials Table: Postal Service Mailability Guide", "US RCRA (Resource Conservation & Recovery Act) - Hazardous Constituents - Appendix VIII to 40 CFR 261", "US RCRA (Resource Conservation & Recovery Act) - List of Hazardous Wastes", "US SARA Section 302 Extremely Hazardous Substances", "US Toxic Substances Control Act (TSCA) - Inventory", "USA: Chemical Facility Anti-Terrorism Standards - List Appendix A - 6CFR 27"

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Potentially explosive peroxides may form on standing.*.
 - Cumulative effects may result following exposure*.
- * (limited evidence).

Ingredients with multiple CAS Nos

Ingredient Name	CAS
boron trifluoride	7637-07-2, 13319-75-0

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- Classification of the mixture and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references.

A list of reference resources used to assist the committee may be found at:
www.chemwatch.net/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. Risks may be determined by reference to Exposures Scenarios. Scale of use, frequency of use and current or available engineering controls must be considered.

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