Safety Data Sheet

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SECTION 1: Identification

1.1. Product identifier
3M™ 11B Enriched Boron Trifluoride (11B BF3)

Product Identification Numbers
LB-1100-3459-9, LB-1100-3460-0, LB-F100-1388-0, LB-F100-1392-5, LB-F100-1392-6, 98-0090-0013-8, 98-0090-0014-6, 98-0090-0015-3, 98-0090-0016-1, 98-0090-0017-9, 98-0090-0018-7, 98-0213-3777-3, 98-0213-3898-7
7100062158, 7010401734, 7010352138, 7100117018, 7010320127, 7010401736, 7100216667, 7100242695

1.2. Recommended use and restrictions on use

Recommended use
Nuclear Applications

1.3. Supplier's details

MANUFACTURER:	3M Technical Ceramics, Inc.
DIVISION:	3M Technical Ceramics, Inc.
ADDRESS:	3M Center, St. Paul, MN 55144-1000, USA
Telephone:	1-800-364-3577

1.4. Emergency telephone number
1-800-364-3577 or (651) 737-6501 (24 hours)

SECTION 2: Hazard identification

2.1. Hazard classification
Gas Under Pressure: Compressed gas.
Acute Toxicity (inhalation): Category 3.
Skin Corrosion/Irritation: Category 1A.
Serious Eye Damage/Irritation: Category 1.
Specific Target Organ Toxicity (repeated exposure): Category 2.
Specific Target Organ Toxicity (single exposure): Category 3.

2.2. Label elements
Signal word
Danger

Symbols
Gas cylinder |Corrosion |Skull and crossbones |Exclamation mark |Health Hazard |

Pictograms



Hazard Statements
Contains gas under pressure; may explode if heated.

Toxic if inhaled.
Causes severe skin burns and eye damage.
May cause respiratory irritation.

May cause damage to organs through prolonged or repeated exposure: kidney/urinary tract.

Precautionary statements

Prevention:
Do not breathe gas.
Wash exposed skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Wear protective gloves, protective clothing, eye protection, and face protection.

Response:
IF SWALLOWED: Rinse mouth. Do NOT induce vomiting.
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower.
IF INHALED: Remove person to fresh air and keep comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF exposed or concerned: Immediately call a POISON CENTER or doctor.
Get medical attention if you feel unwell.
Wash contaminated clothing before reuse.

Storage:
Store in a well-ventilated place. Keep container tightly closed.
Store locked up.
Protect from sunlight.

Disposal:
Dispose of contents and container in accordance with applicable local, regional, national, and international regulations.

2.3. Hazards not otherwise classified
May cause chemical gastrointestinal burns.

SECTION 3: Composition/information on ingredients

Ingredient	C.A.S. No.	% by Wt
Borane-11B, trifluoro-	20654-88-0	80 - 100 Trade Secret *

*The specific chemical identity and/or exact percentage (concentration) of this composition has been withheld as a trade secret.

SECTION 4: First aid measures

4.1. Description of first aid measures

Inhalation:
Remove person to fresh air. Get medical attention.

Skin Contact:
Immediately flush with large amounts of water for at least 15 minutes. Remove contaminated clothing. Get immediate medical attention. Wash clothing before reuse.

Eye Contact:
Immediately flush with large amounts of water for at least 15 minutes. Remove contact lenses if easy to do. Continue rinsing. Immediately get medical attention.

If Swallowed:
Rinse mouth. Do not induce vomiting. Get immediate medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Toxic if inhaled. Irritating to the respiratory tract (coughing, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain). Skin burns (localized redness, swelling, itching, intense pain, blistering, and tissue destruction). Serious damage to the eyes (corneal cloudiness, severe pain, tearing, ulcerations, and significantly impaired or loss of vision). Target organ effects following prolonged or repeated exposure. See Section 11 for additional details.

4.3. Indication of any immediate medical attention and special treatment required
Not applicable.

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media
DO NOT USE WATER Material will not burn. Use a fire fighting agent suitable for the surrounding fire.

5.2. Special hazards arising from the substance or mixture
Exposure to extreme heat can give rise to thermal decomposition.

Hazardous Decomposition or By-Products

Substance	Condition
Toxic Vapor, Gas, Particulate	During Combustion

5.3. Special protective actions for fire-fighters
Wear full protective clothing, including helmet, self-contained, positive pressure or pressure demand breathing apparatus, bunker coat and pants, bands around arms, waist and legs, face mask, and protective covering for exposed areas of the head.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
Evacuate area. Responders to a spill or accidental release of this material may need a higher level of eye, skin and respiratory protection than those specified in Section 8 of this SDS. Specific choices should be based on the judgement of an expert at the scene. Do not handle until all safety precautions have been read and understood. Ventilate the area with fresh air. For large spill, or spills in confined spaces, provide mechanical ventilation to disperse or exhaust vapors, in accordance with good industrial hygiene practice. Use personal protective equipment based on the results of an exposure assessment. Refer to Section 8 for PPE recommendations. If anticipated exposure resulting from an accidental release exceeds the protective capabilities of the PPE listed in Section 8, or are unknown, select PPE that offers an appropriate level of protection. Consider the physical and chemical hazards of the material when doing so. Examples of PPE ensembles for emergency response could include wearing bunker gear for a release of flammable material; wearing chemical protective clothing if the spilled material is a corrosive, a sensitizer, a significant dermal irritant, or can be absorbed through the skin; or

donning a positive pressure supplied-air respirator for chemicals with inhalation hazards. For information regarding physical and health hazards, refer to sections 2 and 11 of the SDS.

6.2. Environmental precautions
Avoid release to the environment.

6.3. Methods and material for containment and cleaning up
If possible, seal leaking container. Place leaking containers in a well-ventilated area, preferably an operating exhaust hood, or if necessary outdoors on an impermeable surface until appropriate packaging for the leaking container or its contents is available. Close cylinder. Place in a closed container approved for transportation by appropriate authorities. Dispose of collected material as soon as possible in accordance with applicable local/regional/national/international regulations.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Do not breathe thermal decomposition products. For industrial/occupational use only. Not for consumer sale or use. Do not use in a confined area with minimal air exchange. Do not handle until all safety precautions have been read and understood. Do not breathe dust/fume/gas/mist/vapors/spray. Do not get in eyes, on skin, or on clothing. Do not eat, drink or smoke when using this product. Wash thoroughly after handling. Wash contaminated clothing before reuse. Handle and install cylinders in accordance with applicable local/regional/national/international codes and/or regulations. Protect cylinders from physical damage; do not drag, roll, slide, drop, or lift the cylinder by its protective valve cap. Keep the protective, removable valve cover in place when moving the cylinder. Never insert a tool or other object into the valve cap openings to assist with removing the cap. Use an adjustable strap wrench to remove over-tight or rusted caps.

7.2. Conditions for safe storage including any incompatibilities
Store in accordance with applicable local/regional/national/international codes and/or regulations. Keep container tightly closed to prevent contamination with water or air. If contamination is suspected, do not reseal container. Protect from sunlight. Store in a well-ventilated place. Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Occupational exposure limits
If a component is disclosed in section 3 but does not appear in the table below, an occupational exposure limit is not available for the component.

Ingredient	C.A.S. No.	Agency	Limit type	Additional Comments
Boron trifluoride	20654-88-0	ACGIH	TWA:0.1 ppm;CEIL:0.7 ppm	
boron trifluoride	20654-88-0	OSHA	CEIL:3 mg/m3(1 ppm)	
FLUORIDE AS DUST	20654-88-0	OSHA	TWA(as F):2.5 mg/m3;TWA(as dust):2.5 mg/m3	
Fluorides, as F	20654-88-0	ACGIH	TWA(as F):2.5 mg/m3	A4: Not class. as human carcin

ACGIH : American Conference of Governmental Industrial Hygienists
AIHA : American Industrial Hygiene Association
CMRG : Chemical Manufacturer's Recommended Guidelines
OSHA : United States Department of Labor - Occupational Safety and Health Administration
TWA: Time-Weighted-Average
STEL: Short Term Exposure Limit
CEIL: Ceiling

8.2. Exposure controls

8.2.1. Engineering controls
Use with appropriate local exhaust ventilation. For those situations where the material might be exposed to extreme

overheating due to misuse or equipment failure, use with appropriate local exhaust ventilation sufficient to maintain levels of thermal decomposition products below their exposure guidelines. Provide local exhaust ventilation at transfer points.

8.2.2. Personal protective equipment (PPE)

Eye/face protection

Select and use eye/face protection to prevent contact based on the results of an exposure assessment. The following eye/face protection(s) are recommended:
Full Face Shield
Indirect Vented Goggles

Skin/hand protection
Select and use gloves and/or protective clothing approved to relevant local standards to prevent skin contact based on the results of an exposure assessment. Selection should be based on use factors such as exposure levels, concentration of the substance or mixture, frequency and duration, physical challenges such as temperature extremes, and other use conditions. Consult with your glove and/or protective clothing manufacturer for selection of appropriate compatible gloves/protective clothing. Note: Nitrile gloves may be worn over polymer laminate gloves to improve dexterity.

Gloves made from the following material(s) are recommended: Polymer laminate

If this product is used in a manner that presents a higher potential for exposure (e.g., spraying, high splash potential, etc.), then use of a protective apron may be necessary. See recommended glove material(s) for determining appropriate apron material(s). If a glove material is not available as an apron, polymer laminate is a suitable option.

The following protective clothing material(s) are also recommended: Coveralls - Disposable, laminate

Respiratory protection

An exposure assessment may be needed to decide if a respirator is required. If a respirator is needed, use respirators as part of a full respiratory protection program. Based on the results of the exposure assessment, select from the following respirator type(s) to reduce inhalation exposure:
For those situations where the material might be exposed to extreme overheating due to misuse or equipment failure, use a positive pressure supplied-air respirator.
Half facepiece or full facepiece air-purifying respirator suitable for organic vapors or acid gases
Half facepiece or full facepiece supplied-air respirator

For questions about suitability for a specific application, consult with your respirator manufacturer.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Gas
Color	Colorless
Odor	Pungent Fuming
Odor threshold	*Not Applicable*
pH	*Not Applicable*
Melting point/Freezing point	-128 ºC [@ 101,325 Pa]
Boiling point/Initial boiling point/Boiling range	-100.3 ºC
Flash Point	No flash point
Evaporation rate	*Not Applicable*
Flammability	Not Applicable
Flammable Limits(LEL)	*Not Applicable*

Flammable Limits(UEL)	*Not Applicable*
Vapor Pressure	*No Data Available*
Relative Vapor Density	2.38
Density	3.072 kg/m3 [@ 21.1 ºC]
Relative Density	2.99 [*Ref Std:*WATER=1]
Water solubility	*No Data Available*
Solubility- non-water	*Not Applicable*
Partition coefficient: n-octanol/ water	*Not Applicable*
Autoignition temperature	*Not Applicable*
Decomposition temperature	*Not Applicable*
Kinematic Viscosity	*Not Applicable*
Volatile Organic Compounds	*No Data Available*
Percent volatile	100 %
VOC Less H2O & Exempt Solvents	*No Data Available*
Molecular weight	*No Data Available*

Particle Characteristics	*Not Applicable*

SECTION 10: Stability and reactivity

10.1. Reactivity
This material may be reactive with certain agents under certain conditions - see the remaining headings in this section.

10.2. Chemical stability
Stable.

10.3. Possibility of hazardous reactions
Hazardous polymerization will not occur.

10.4. Conditions to avoid
Heat

10.5. Incompatible materials
Alkali and alkaline earth metals

10.6. Hazardous decomposition products

Substance	**Condition**
Hydrogen Fluoride	At Elevated Temperatures

Refer to section 5.2 for hazardous decomposition products during combustion.

Extreme heat arising from situations such as misuse or equipment failure can generate hydrogen fluoride as a decomposition product.

SECTION 11: Toxicological information

The information below may not be consistent with the material classification in Section 2 if specific ingredient classifications are mandated by a competent authority. In addition, toxicological data on ingredients may not be reflected in the material classification and/or the signs and symptoms of exposure, because an ingredient may be present below the threshold for labeling, an ingredient may not be available for exposure, or the data may not be relevant to the material as a whole.

11.1. Information on Toxicological effects

Signs and Symptoms of Exposure

Based on test data and/or information on the components, this material may produce the following health effects:

Inhalation:
Toxic if inhaled.
Respiratory Tract Irritation: Signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.

May cause additional health effects (see below).

Skin Contact:
Corrosive (Skin Burns): Signs/symptoms may include localized redness, swelling, itching, intense pain, blistering, ulceration, and tissue destruction.

Eye Contact:
Corrosive (Eye Burns): Signs/symptoms may include cloudy appearance of the cornea, chemical burns, severe pain, tearing, ulcerations, significantly impaired vision or complete loss of vision.

Ingestion:
Gastrointestinal Corrosion: Signs/symptoms may include severe mouth, throat and abdominal pain; nausea; vomiting; and diarrhea; blood in the feces and/or vomitus may also be seen.

Additional Health Effects:

Prolonged or repeated exposure may cause target organ effects:
Kidney/Bladder Effects: Signs/symptoms may include changes in urine production, abdominal or lower back pain, increased protein in urine, increased blood urea nitrogen (BUN), blood in urine, and painful urination.

Toxicological Data
If a component is disclosed in section 3 but does not appear in a table below, either no data are available for that endpoint or the data are not sufficient for classification.

Acute Toxicity

Name	Route	Species	Value
Overall product	Inhalation-Gas(4 hr)		No data available; calculated ATE >500 - =2,500 ppm
Borane-11B, trifluoro-	Inhalation-Gas	Professional judgement	LC50 estimated to be 500 - 2,500 ppm
Borane-11B, trifluoro-	Inhalation-Dust/Mist (4 hours)	Rat	LC50 0.79 mg/l

ATE = acute toxicity estimate

Skin Corrosion/Irritation

Name	Species	Value
Borane-11B, trifluoro-	official classification	Corrosive

Serious Eye Damage/Irritation

Name	Species	Value
Borane-11B, trifluoro-	similar	Corrosive

	health hazards	

Skin Sensitization
For the component/components, either no data are currently available or the data are not sufficient for classification.

Respiratory Sensitization
For the component/components, either no data are currently available or the data are not sufficient for classification.

Germ Cell Mutagenicity

Name	Route	Value
Borane-11B, trifluoro-	In Vitro	Some positive data exist, but the data are not sufficient for classification

Carcinogenicity
For the component/components, either no data are currently available or the data are not sufficient for classification.

Reproductive Toxicity

Reproductive and/or Developmental Effects
For the component/components, either no data are currently available or the data are not sufficient for classification.

Target Organ(s)

Specific Target Organ Toxicity - single exposure

Name	Route	Target Organ(s)	Value	Species	Test Result	Exposure Duration
Borane-11B, trifluoro-	Inhalation	respiratory irritation	May cause respiratory irritation	similar health hazards	NOAEL Not available	

Specific Target Organ Toxicity - repeated exposure

Name	Route	Target Organ(s)	Value	Species	Test Result	Exposure Duration
Borane-11B, trifluoro-	Inhalation	kidney and/or bladder	May cause damage to organs though prolonged or repeated exposure	Rat	NOAEL 0.006 mg/l	13 weeks
Borane-11B, trifluoro-	Inhalation	heart	Not classified	Rat	NOAEL 0.017 mg/l	13 weeks
Borane-11B, trifluoro-	Inhalation	hematopoietic system	Not classified	Rat	NOAEL 0.017 mg/l	13 weeks
Borane-11B, trifluoro-	Inhalation	liver	Not classified	Rat	NOAEL 0.017 mg/l	13 weeks
Borane-11B, trifluoro-	Inhalation	nervous system	Not classified	Rat	NOAEL 0.017 mg/l	13 weeks
Borane-11B, trifluoro-	Inhalation	respiratory system	Not classified	Rat	NOAEL 0.017 mg/l	13 weeks

Aspiration Hazard
For the component/components, either no data are currently available or the data are not sufficient for classification.

Please contact the address or phone number listed on the first page of the SDS for additional toxicological information on this material and/or its components.

SECTION 12: Ecological information

Ecotoxicological information

Please contact the address or phone number listed on the first page of the SDS for additional ecotoxicological information on this material and/or its components.

Chemical fate information

Please contact the address or phone number listed on the first page of the SDS for additional chemical fate information on this material and/or its components.

SECTION 13: Disposal considerations

13.1. Disposal methods
Dispose of contents/ container in accordance with the local/regional/national/international regulations.

Dispose of waste product in a permitted industrial waste facility. The facility should be equipped to handle gaseous waste. Empty drums/barrels/containers used for transporting and handling hazardous chemicals (chemical substances/mixtures/preparations classified as Hazardous as per applicable regulations) shall be considered, stored, treated & disposed of as hazardous wastes unless otherwise defined by applicable waste regulations. Consult with the respective regulating authorities to determine the available treatment and disposal facilities.

EPA Hazardous Waste Number (RCRA): D003 (Reactive)

SECTION 14: Transport Information

Please contact the emergency numbers listed on the first page of the SDS for Transportation Information for this material.

SECTION 15: Regulatory information

15.1. US Federal Regulations
Contact manufacturer for more information

EPCRA 311/312 Hazard Classifications:

Physical Hazards
Gas under pressure

Health Hazards
Acute toxicity
Hazard Not Otherwise Classified (HNOC)
Serious eye damage or eye irritation
Skin Corrosion or Irritation
Specific target organ toxicity (single or repeated exposure)

Section 313 Toxic Chemicals subject to the reporting requirements of that section and 40 CFR part 372 (EPCRA):

Ingredient	C.A.S. No	% by Wt
Borane-11B, trifluoro-	20654-88-0	Trade Secret 80 - 100

15.2. State Regulations
Contact manufacturer for more information

15.3. Chemical Inventories
The components of this material are in compliance with the provisions of the Korean Toxic Chemical Control Law. Certain restrictions may apply. Contact the selling division for additional information.

The components of this product are in compliance with the chemical notification requirements of TSCA. All required components of this product are listed on the active portion of the TSCA Inventory.

Contact manufacturer for more information

15.4. International Regulations

Contact manufacturer for more information

This SDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: Other information

NFPA Hazard Classification
Health: 4 **Flammability:** 0 **Instability:** 1 **Special Hazards:** Reacts with Water

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

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