



Safety Data Sheet

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Document Group:	44-8374-9	Version Number:	4.00
Issue Date:	04/13/26	Supersedes Date:	04/13/26

SECTION 1: Identification

1.1. Product identifier

3M™ 10B Enriched Zirconium Diboride Sputtering Targets (10B ZrB2)

Product Identification Numbers

LB-1100-3457-0, LB-1100-3457-1, LB-1100-3457-2, LB-1100-3457-3

1.2. Recommended use and restrictions on use

Recommended use

Sputtering targets for nuclear reactor use

1.3. Supplier's details

MANUFACTURER:	3M
DIVISION:	Advanced Materials Division
ADDRESS:	3M Center, St. Paul, MN 55144-1000, USA
Telephone:	1-888-3M HELPS (1-888-364-3577)

1.4. Emergency telephone number

1-800-364-3577 or (651) 737-6501 (24 hours)

SECTION 2: Hazard identification

2.1. Hazard classification

Reproductive Toxicity: Category 1B.

2.2. Label elements

Signal word

Danger

Symbols

Health Hazard |

Pictograms



Hazard Statements

May damage fertility or the unborn child.

Precautionary statements**Prevention:**

Obtain special instructions before use.

Do not handle until all safety precautions have been read and understood.

Wear protective gloves.

Response:

IF exposed or concerned: Get medical attention.

Storage:

Store locked up.

Disposal:

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

SECTION 3: Composition/information on ingredients

Ingredient	C.A.S. No.	% by Wt
Boron Oxide, labeled with boron-10	200443-97-6	< 0.2
Zirconium boride (ZrB ₂), labeled with boron-10	200444-01-5	> 99.8

SECTION 4: First aid measures**4.1. Description of first aid measures****Inhalation:**

Remove person to fresh air. If you are concerned, get medical advice.

Skin Contact:

Wash with soap and water. If you are concerned, get medical advice.

Eye Contact:

No need for first aid is anticipated. If signs/symptoms persist, get medical attention.

If Swallowed:

Rinse mouth. If you are concerned, get medical advice.

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

No critical symptoms or effects. See Section 11.1, information on toxicological effects.

4.3. Indication of any immediate medical attention and special treatment required

Not applicable

SECTION 5: Fire-fighting measures**5.1. Suitable extinguishing media**

Non-combustible. Use a fire fighting agent suitable for surrounding fire.

5.2. Special hazards arising from the substance or mixture

None inherent in this product.

5.3. Special protective actions for fire-fighters

No special protective actions for fire-fighters are anticipated.

SECTION 6: Accidental release measures**6.1. Personal precautions, protective equipment and emergency procedures**

Evacuate area. 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

Collect as much of the spilled material as possible. Place in a closed container approved for transportation by appropriate authorities. Clean up residue. Seal the container. 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 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. Avoid contact with oxidizing agents (eg. chlorine, chromic acid etc.) Use personal protective equipment (gloves, respirators, etc.) as required.

7.2. Conditions for safe storage including any incompatibilities

Store away from acids. Store away from oxidizing agents.

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 oxide	200443-97-6	ACGIH	TWA:10 mg/m3	
Boron oxide, total dust	200443-97-6	OSHA	TWA(as total dust):15 mg/m3	

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 general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below relevant Exposure Limits and/or control dust/fume/gas/mist/vapors/spray. If ventilation is not adequate, use respiratory protection equipment.

8.2.2. Personal protective equipment (PPE)

Eye/face protection

None required.

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.

Gloves made from the following material(s) are recommended: Chemical Protective glove of any material type

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:

Full facepiece air-purifying respirator suitable for particulates

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

Refer to Section 15 for additional information

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	Solid
Specific Physical Form:	Sputtering Target
Color	Gray
Odor	Odorless
Odor threshold	<i>No Data Available</i>
pH	<i>Not Applicable</i>
Melting point/Freezing point	3,040 °C
Boiling point/Initial boiling point/Boiling range	<i>Not Applicable</i>
Flash Point	No flash point
Evaporation rate	<i>Not Applicable</i>
Flammability	Not Applicable
Flammable Limits(LEL)	<i>Not Applicable</i>
Flammable Limits(UEL)	<i>Not Applicable</i>
Vapor Pressure	<i>Not Applicable</i>
Relative Vapor Density	<i>Not Applicable</i>
Density	6.1 g/cm ³
Relative Density	6.1 [Ref Std: WATER=1]

Water solubility	Nil
Solubility- non-water	No Data Available
Partition coefficient: n-octanol/ water	No Data Available
Autoignition temperature	Not Applicable
Decomposition temperature	No Data Available
Kinematic Viscosity	No Data Available
Volatile Organic Compounds	No Data Available
Percent volatile	No Data Available
VOC Less H2O & Exempt Solvents	No Data Available

Particle Characteristics	Not Applicable
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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

None known.

10.5. Incompatible materials

Strong acids

Strong oxidizing agents

10.6. Hazardous decomposition products

<u>Substance</u>	<u>Condition</u>
Toxic Vapor, Gas, Particulate	At Elevated Temperatures

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:

No known health effects.

Skin Contact:

Contact with the skin during product use is not expected to result in significant irritation.

Eye Contact:

Contact with the eyes during product use is not expected to result in significant irritation.

Ingestion:

May cause additional health effects (see below).

Additional Health Effects:**Reproductive/Developmental Toxicity:**

Contains a chemical or chemicals which can cause birth defects or other reproductive harm.

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	Ingestion		No data available; calculated ATE >5,000 mg/kg
Zirconium boride (ZrB2), labeled with boron-10	Ingestion	Rat	LD50 > 2,000 mg/kg
Zirconium boride (ZrB2), labeled with boron-10	Dermal	similar health hazards	LD50 estimated to be > 5,000 mg/kg
Boron Oxide, labeled with boron-10	Dermal	Rabbit	LD50 > 2,000 mg/kg
Boron Oxide, labeled with boron-10	Inhalation-Dust/Mist (4 hours)	Rat	LC50 > 2.12 mg/l
Boron Oxide, labeled with boron-10	Ingestion	Rat	LD50 3,450 mg/kg

ATE = acute toxicity estimate

Skin Corrosion/Irritation

Name	Species	Value
Zirconium boride (ZrB2), labeled with boron-10	In vitro data	No significant irritation
Boron Oxide, labeled with boron-10	Rabbit	No significant irritation

Serious Eye Damage/Irritation

Name	Species	Value
Zirconium boride (ZrB2), labeled with boron-10	In vitro data	No significant irritation
Boron Oxide, labeled with boron-10	Rabbit	Mild irritant

Skin Sensitization

Name	Species	Value
Zirconium boride (ZrB2), labeled with boron-10	Guinea pig	Not classified
Boron Oxide, labeled with boron-10	Guinea pig	Not classified

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
Zirconium boride (ZrB2), labeled with boron-10	In Vitro	Not mutagenic
Boron Oxide, labeled with boron-10	In Vitro	Not mutagenic
Boron Oxide, labeled with boron-10	In vivo	Not mutagenic

Carcinogenicity

Name	Route	Species	Value
Boron Oxide, labeled with boron-10	Ingestion	Mouse	Not carcinogenic

Reproductive Toxicity**Reproductive and/or Developmental Effects**

Name	Route	Value	Species	Test Result	Exposure Duration
Boron Oxide, labeled with boron-10	Ingestion	Toxic to female reproduction	Rat	NOAEL 100 mg/kg/day	3 generation
Boron Oxide, labeled with boron-10	Ingestion	Toxic to male reproduction	Rat	NOAEL 100 mg/kg/day	3 generation
Boron Oxide, labeled with boron-10	Ingestion	Toxic to development	Rabbit	NOAEL 125 mg/kg/day	during organogenesis

Target Organ(s)**Specific Target Organ Toxicity - single exposure**

Name	Route	Target Organ(s)	Value	Species	Test Result	Exposure Duration
Boron Oxide, labeled with boron-10	Inhalation	respiratory irritation	Not classified	Human	NOAEL Not available	occupational exposure
Boron Oxide, labeled with boron-10	Ingestion	nervous system	Not classified	Rat	NOAEL 2,000 mg/kg	

Specific Target Organ Toxicity - repeated exposure

Name	Route	Target Organ(s)	Value	Species	Test Result	Exposure Duration
Boron Oxide, labeled with boron-10	Ingestion	hematopoietic system	Some positive data exist, but the data are not sufficient for classification	Rat	NOAEL 100 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	kidney and/or bladder	Not classified	Rat	NOAEL 400 mg/kg/day	45 days
Boron Oxide, labeled with boron-10	Ingestion	heart	Not classified	Rat	NOAEL 334 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	endocrine system	Not classified	Rat	NOAEL 334 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	gastrointestinal tract	Not classified	Rat	NOAEL 334 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	bone, teeth, nails, and/or hair	Not classified	Rat	NOAEL 334 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	liver	Not classified	Rat	NOAEL 334 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	nervous system	Not classified	Rat	NOAEL 334 mg/kg/day	2 years
Boron Oxide, labeled with boron-10	Ingestion	respiratory system	Not classified	Rat	NOAEL 334 mg/kg/day	2 years

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. 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): Not regulated

SECTION 14: Transport Information

For Transport Information, please visit <http://3M.com/Transportinfo> or call 1-800-364-3577 or 651-737-6501.

SECTION 15: Regulatory information

15.1. US Federal Regulations

Contact 3M for more information.

EPCRA 311/312 Hazard Classifications:

Physical Hazards

Not Applicable.

Health Hazards

Reproductive toxicity

Additional TSCA Information

Components	CAS No	Additional Information
Boron Oxide, labeled with boron-10	200443-97-6	Allowed use(s): Precursor material for iron boride and boron carbide production.
Zirconium boride (ZrB2), labeled with boron-10	200444-01-5	Allowed use(s): Sputtering targets for nuclear reactor use. Use a full face respirator (respirator w/ protection factor > 50) P100 cartridge.

15.2. State Regulations

Contact 3M for more information.

15.3. Chemical Inventories

The components of this product are in compliance with the chemical notification requirements of TSCA. One or more of the components in this material is not listed on the TSCA inventory, but is approved for specific commercial use(s) under a US EPA low volume exemption.

Contact 3M for more information.

15.4. International Regulations

Contact 3M 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: 0 **Flammability:** 0 **Instability:** 0 **Special Hazards:** None

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.

HMIS Hazard Classification

Health: *0 **Flammability:** 0 **Physical Hazard:** 0 **Personal Protection:** X - See PPE section.

Hazardous Material Identification System (HMIS® IV) hazard ratings are designed to inform employees of chemical hazards in the workplace. These ratings are based on the inherent properties of the material under expected conditions of normal use and are not intended for use in emergency situations. HMIS® IV ratings are to be used with a fully implemented HMIS® IV program. HMIS® is a registered mark of the American Coatings Association (ACA).

Document Group:	44-8374-9	Version Number:	4.00
Issue Date:	04/13/26	Supersedes Date:	04/13/26

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