

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, and Canadian WHMIS

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

<u>TRADE NAME (AS LABELED):</u>	BORON 11B CARBIDE
<u>CHEMICAL NAME/CLASS:</u>	Boron Compound
<u>SYNONYMS:</u>	Enriched Boron Carbide; (B ₄ C) ₉ Labeled with ¹¹ B
<u>FORMULA:</u>	¹¹ B ₄ C
<u>PRODUCT USE:</u>	Various Uses
<u>SUPPLIER/MANUFACTURER'S NAME:</u>	BORON PRODUCTS, LLC. A CERADYNE COMPANY
<u>ADDRESS:</u>	798 Highway 69A, Quapaw, OK 74363 PO Box 798, Quapaw, OK 74363
<u>EMERGENCY PHONE:</u>	1-918-673-2201
<u>24 HR EMERGENCY PHONE:</u>	InfoTrac: 1-800-535-5053
<u>TECHNICAL CONTACT PHONE:</u>	1-918-673-2201 (8:00 a.m. to 4:30 p.m., Mon.-Fri.)
<u>DATE OF PREPARATION:</u>	November 14, 2007

2. COMPOSITION and INFORMATION ON INGREDIENTS

This product is an organic borate compound.

EU LABELING AND CLASSIFICATION: A classification by the European Community Council Directives has not yet been published in Annex I. The following is a self-classification, based on currently known properties of this material.

EU CLASSIFICATION: [Xn]: HARMFUL; [Xi]: IRRITANT

EU RISK PHRASES: R: 20/22; R: 36/37

CHEMICAL NAME	CAS #	EINECS #	% w/v	EU CLASSIFICATION FOR COMPONENTS
Boron 11B Carbide	200443-96-5	Unlisted	100%	SELF-CLASSIFICATION HAZARD CLASSIFICATION: Xn: Harmful; Xi: Irritant RISK PHRASES: R: 20/22; R: 36/37

See Section 15 for full EU classification information of product and components.

NOTE: ALL Canadian WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR. The MSDS is also prepared to include all European Union required information under EU Directives.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Boron 11B Carbide is a metallic, grey to black, odorless, powdered or crystalline solid.

Health Hazards: May produce irritation of the nasal mucous membranes, the respiratory tract, and eyes. Ingestion of this material may cause harm. Prolonged or chronic exposure may cause adverse effects on the central nervous system, gastrointestinal system, liver and/or renal damage.

Flammability Hazards: Boron Carbide is not flammable; however, finely divided dusts of this material can present a fire or explosion hazard in the presence of spark or open flame. If involved in a fire, this material will decompose to form boron oxides.

Reactivity Hazards: Boron Carbide is not reactive.

Environmental Hazards: Release of this material to the environment may cause harm to plants and animals.

Emergency Recommendations: Emergency responders must wear personal protective equipment appropriate for the situation to which they are responding and to the chemical hazards of this material. Caution should be used when responding to releases.

SYMPTOMS OF OVEREXPOSURE BY ROUTE OF EXPOSURE: Contact with this material may be harmful. The symptoms of overexposure to this product, via route of exposure are as follows:

INHALATION: Inhalation of dusts or particulates of Boron Carbide may cause irritation. Symptoms may include coughing, difficulty breathing and sneezing. Chronic inhalation exposure may cause boron poisoning with symptoms described under 'Other Health Effects'.

CONTACT WITH SKIN or EYES: Depending on the duration and concentration of overexposure, skin contact may cause redness, and irritation. Repeated or prolonged skin exposure may cause dry skin, rash or inflammation. Eye contact will cause irritation, pain and tearing.

SKIN ABSORPTION: Boron Carbide may be absorbed via intact skin. Symptoms may include those described under 'Ingestion' and 'Other Health Effects'.

3. HAZARD IDENTIFICATION (Continued)

INGESTION: Ingestion of Boron Carbide can cause nausea, vomiting, and diarrhea. Other symptoms of ingestion may include those experienced after ingestion of borate compounds, such as boric acid and may include epigastric pain, weakness, lethargy, headache, restlessness, fever, tremors, and convulsions with central nervous system depression.

INJECTION: Injection is not a significant route of exposure for this product.

OTHER POTENTIAL HEALTH EFFECTS: Only a few human studies have been conducted to assess health effects associated with exposure to boron compounds. The available data show that exposure is associated with short-term irritant effects on the upper respiratory tract, nasopharynx, and eye. These effects, however, appear to be short-term and reversible. The sole long-term (7-year) follow-up study failed to identify any long-term health effects. No studies have been identified that assess reproductive outcomes. Chronic boron compound poisoning (from ingestion, skin absorption, or absorption from body cavities or mucous membranes) may result after prolonged absorption and may include symptoms such as anorexia, weight loss, vomiting, mild diarrhea, skin rash, alopecia, convulsions and anemia, although these symptoms are more likely with boric acid and other borate compounds.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms.

ACUTE: Acute exposure by all routes may cause irritation of exposed tissues.

CHRONIC: Chronic exposure to Boron Carbide can cause borate poisoning with adverse symptoms to the central nervous system, skin, kidneys, blood system and liver. See Section 11 (Toxicological Information) for further information.

TARGET ORGANS: ACUTE: Skin, eyes, respiratory system. CHRONIC: Central nervous system, skin, liver, kidneys, blood system, respiratory system, gastrointestinal system.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM			
HEALTH HAZARD	(BLUE)	1	
FLAMMABILITY HAZARD	(RED)	1	
PHYSICAL HAZARD	(YELLOW)	0	
PROTECTIVE EQUIPMENT			
EYES	RESPIRATORY	HANDS	BODY
SEE SECTION 8			
For Routine Industrial Use and Handling Applications			

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate
3 = Serious 4 = Severe * = Chronic hazard

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

RESCUERS SHOULD NOT ATTEMPT TO RETRIEVE VICTIMS OF EXPOSURE TO THIS MATERIAL WITHOUT ADEQUATE PERSONAL PROTECTIVE EQUIPMENT.

Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take copy of label and MSDS to physician or other health professional with victim(s). Consult a physician and/or the nearest Poison Control Center for all exposures except minor instances of skin contact.

INHALATION: Remove victim(s) to fresh air as quickly as possible. Only trained personnel should administer supplemental oxygen and/or cardiopulmonary resuscitation if necessary. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Remove or cover gross contamination to avoid exposure to rescuers. Seek immediate medical attention.

SKIN EXPOSURE: If this material contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Do not interrupt flushing. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim must seek immediate medical attention if any adverse effect occurs.

EYE EXPOSURE: If this material enters the eyes, open contaminated individual's eyes while under gently running water. Use sufficient force to open eyelids. Have contaminated individual "roll" eyes. Minimum flushing is for 15 minutes. Do not interrupt flushing. Seek immediate medical attention.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Disorders including diabetes, heart or cardiovascular disorders, immune system disorders or allergies, kidney disorders, liver disorders, nervous system disorders, and skin disorders may be aggravated by overexposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treatment is purely symptomatic. Plasma volume should be maintained by infusion of copious amounts of appropriate fluid.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower: Not applicable.

Upper: Not applicable.

FIRE EXTINGUISHING MATERIALS: Use extinguishing material suitable to the surrounding fire.

Water Spray: YES (for cooling)

Carbon Dioxide: YES

Foam: YES

Dry Chemical: YES

Halon: NO

Other: "D" Class

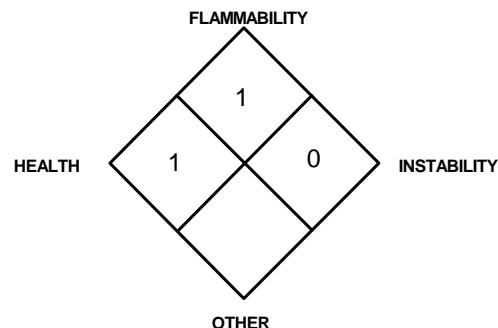
UNUSUAL FIRE AND EXPLOSION HAZARDS: Boron Carbide is not flammable; however, finely divided dusts of this material can present a fire or explosion hazard in the presence of spark or open flame. An accumulation of large amounts of dust from this material in air can cause a severe risk of an air/dust explosion. When involved in a fire, this product will decompose to form boron oxides. Contact with some metal powders can result in formation of flammable hydrogen gas.

Explosion Sensitivity to Mechanical Impact: Not applicable.

Explosion Sensitivity to Static Discharge: Although this material is not sensitive to static discharge, dusts of this material can be ignited by static discharge, especially if large amounts of dusts are allowed to accumulate. All equipment in used in the handling of this material should be electrically grounded.

SPECIAL FIRE-FIGHTING PROCEDURES: Structural fire-fighters must wear Self-Contained Breathing Apparatus and full protective equipment. Chemical resistant clothing may be necessary. Move containers from fire area if it can be done without risk to personnel. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas. Rinse contaminated equipment thoroughly with sodium bicarbonate solution (or another neutralizer for acids) before returning such equipment to service.

NFPA RATING



Hazard Scale: **0** = Minimal **1** = Slight **2** = Moderate
3 = Serious **4** = Severe

6. ACCIDENTAL RELEASE MEASURES

RELEASE RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area and protect people. For small releases, clean-up spilled liquid wearing gloves, goggles, faceshield, and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incident releases should be **Level B: triple-gloves (neoprene gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard-hat, and Self-Contained Breathing Apparatus.** Monitor the area for dusts of this compound and the level of oxygen. Monitoring must indicate that exposure levels are below those provided in Section 8 (Exposure Limits and Personal Protective Equipment) and that oxygen levels are above 19.5% before anyone is permitted in the area without Self-Contained Breathing Apparatus. Sweep-up or vacuum spilled solid (an explosion-proof vacuum should be used). Decontaminate the area thoroughly. Test area with litmus paper to ensure neutralization. Place all spill residue in a suitable container. Dispose of in accordance with applicable U.S. Federal, State, or local procedures, or appropriate Canadian standards and those of EU Member States (see Section 13, Disposal Considerations).

THIS IS A POTENTIALLY HARMFUL SOLID. Protection of all personnel and the area must be maintained. All responders must be adequately protected from exposure.

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts or particulates generated by this product. Use in a well-ventilated location. Wipe-down area routinely to avoid the accumulation of dusts of this product. Remove contaminated clothing immediately.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Keep container tightly closed when not in use. If this product is transferred into another container, only use portable containers and tools approved for the handling toxic, acidic solids. Store containers in a cool, dry location, away from direct sunlight, or sources of intense heat. Material should be stored in secondary containers or in a diked area, as appropriate. Store containers away from incompatible chemicals (see Section 10, Stability and Reactivity). Storage areas should be made of corrosion resistant materials. Post warning and "NO SMOKING" signs in storage and use areas, as appropriate. Empty containers may contain residual particulates which are corrosive; therefore, empty containers should be handled with care. Never store food, feed, or drinking water in containers which held this product.

7. HANDLING and STORAGE (Continued)

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely, if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures and appropriate Canadian standards and those of EU Member States.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

INTERNATIONAL EXPOSURE LIMITS FOR COMPONENTS: Currently, there are no international exposure limits established for this compound.

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided below, if applicable. Ensure eyewash/safety shower stations are available near areas where this product is used.

EXPOSURE LIMITS:

CHEMICAL NAME	CAS #	w/w%	EXPOSURE LIMITS IN AIR							
			ACGIH-TLV		OSHA-PEL		NIOSH			OTHER
			TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	TWA mg/m ³	STEL mg/m ³	IDLH mg/m ³	
Boron Carbide Currently there are no exposure limits for this compound. It is recommended that the following exposure limits for boron and compounds, organic be observed.	200443-95-4	100%	2 (inhal. frac.)	6 (inhal. frac.)	NE	NE	NE	NE	NE	Carcinogen: TLV-A4

NE = Not Established. NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132), or equivalent standard of Canada. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients), if applicable. If respiratory protection is needed, use only protection authorized in the U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93, the European Standard EN149, and EU member states. Use of NIOSH-approved respirator with a protection factor of 50 or greater with P100 or more is micron size is less than 10 microns. Use of a category 21-C air-purifying respirator with P100 cartridge is recommended. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998).

EYE PROTECTION: Splash goggles or safety glasses. If necessary, refer to U.S. OSHA 29 CFR 1910.133, the European Standard EN166 and appropriate Standards of Canada for further information.

HAND PROTECTION: Wear chemical resistant gloves appropriate for use with borate compounds when using this material. Lightweight nitrile or natural rubber gloves are not recommended. Check gloves for leaks prior to use. If necessary, refer to U.S. OSHA 29 CFR 1910.138, and the European Standard DIN EN 374 and Standards of Canada for further information.

BODY PROTECTION: Use body protection appropriate for task. If necessary, refer to appropriate Standards of Canada. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet, or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): Not available.

SPECIFIC GRAVITY: 2.51

SOLUBILITY IN WATER: Insoluble.

EXPANSION RATIO: Not applicable.

ODOR THRESHOLD: Not applicable.

COEFFICIENT WATER/OIL DISTRIBUTION: Not available.

BOLING POINT: 3500°C (6332°F)

APPEARANCE, ODOR AND COLOR: Boron 11B Carbide is a metallic, grey to black, odorless, powdered or crystalline solid.

HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance of this material may be a warning property in event of a release of Boron Carbide.

EVAPORATION RATE (nBuAc = 1): Not applicable.

MELTING/FREEZING POINT: Not available.

VAPOR PRESSURE: Not available.

pH: Not applicable.

VAPOR PRESSURE: Not available.

SPECIFIC VOLUME (ft³/lb): Not available.

MOLECULAR FORMULA: (B₄C)₉ labeled with ¹¹B

10. STABILITY and REACTIVITY

STABILITY: Stable at standard temperatures and pressures.

DECOMPOSITION PRODUCTS: Products of thermal decomposition include boron oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This material is incompatible with chlorine, fluorine, bromine and iodine.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure to high temperatures. Avoid spark or open flame when material is thoroughly dispersed (suspended) in air. Avoid exposure to incompatible chemicals.

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Currently, there are no specific toxicology data currently available for this form of Boron Carbide. The following are toxicity data for Boron Carbide, CAS # 12069-32-8.

BORON CARBIDE:

TCLo (Inhalation-Rat) 300 mg/m³/4 hours/1 years-intermittent: Lungs, Thorax, or Respiration: emphysema, fibrosis (interstitial), other changes

GENERAL TOXICITY INFORMATION: This compound may be harmful via inhalation or ingestion. May cause irritation to mucous membranes, upper respiratory tract, skin and digestive tract. Chronic effects can include central nervous system effects, dry skin, skin eruptions and damage to liver and kidneys may occur as a boron compound.

SUSPECTED CANCER AGENT: As a Boron compound, Boron Carbide is listed by agencies tracking carcinogenic potential, as follows:

ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Carcinogenicity in Humans)

IRRITANCY OF PRODUCT: This product is can be irritating to all contaminated tissue.

SENSITIZATION TO THE PRODUCT: Boron Carbide is not known to be a human skin or respiratory sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this material on the human reproductive system.

Mutagenicity: Boron Carbide is not reported to cause reproductive effects in humans.

Embryotoxicity: Boron Carbide is not reported to produce embryotoxic effects in humans.

Teratogenicity: Boron Carbide is not reported to cause teratogenic effects in humans.

Reproductive Toxicity: Boron Carbide is not reported to cause reproductive effects in humans. For elemental boron, data regarding developmental and reproductive toxicity show that lower fetal body weight in rats is the critical effect. As dose level increases, the effects seen include: further rib effects and testicular pathology in the rat, decreased fetal body weight and increased fetal cardiovascular malformations in the rabbit, and severe testicular pathology in the rat; testicular atrophy and sterility in the rat; reduced fetal body weight in the mouse..

*A **mutagen** is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An **embryotoxin** is a chemical that causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance that interferes in any way with the reproductive process.*

BIOLOGICAL EXPOSURES INDICES (BEIs): Currently, there are no Biological Exposure Indices (BEIs) determined for Boron Carbide.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: Boron Carbide will decompose in the environment to various boron compounds.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: There are currently no data on the effects of Boron Carbide on plants and animals in the environment.

EFFECT OF CHEMICAL ON AQUATIC LIFE: There are no data on the effects of Boron Carbide in an aquatic environment; however, as an insoluble compound, no significant effects are anticipated.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or with regulations of Canada and its Provinces and those of EU Member States. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority. Empty containers, as defined by appropriate sections of RCRA, are not RCRA hazardous wastes. Insure proper management of any residuals remaining in containers.

U.S. EPA WASTE NUMBER: Not applicable.

14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Not Regulated
HAZARD CLASS NUMBER and DESCRIPTION: Not Applicable
UN IDENTIFICATION NUMBER: Not Applicable
DOT LABEL(S) REQUIRED: Not Applicable
PACKAGING GROUP: Not Applicable
EMERGENCY RESPONSE GUIDEBOOK NUMBER (2004): Not Applicable
MARINE POLLUTANT: Not applicable (49 CFR 172.101, Appendix B).

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This product is NOT classified as Dangerous Goods, per regulations of Transport Canada.

INTERNATIONAL MARITIME ORGANIZATION (IMO): This material is NOT classified as Dangerous Goods, per rules of the IMO.

INTERNATIONAL AIR TRANSPORT ASSOCIATION (IATA): This material is NOT classified as Dangerous Goods, per rules of the IATA.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This material is NOT classified as Dangerous Goods, per regulations of the U.N. Economic Commission for Europe.

15. REGULATORY INFORMATION

U.S. STATE AND FEDERAL REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Boron Carbide is not subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act.

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for any component of this product. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lb (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. SARA 302 EXTREMELY HAZARDOUS THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. SARA 304 EXTREMELY HAZARDOUS REPORTABLE QUANTITY (RQ): Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Not applicable.

U.S. TSCA INVENTORY STATUS: Boron Carbide CAS # 200443-95-4 is excluded from the reporting requirements of the TSCA Chemical Inventory Regulations as a derivative of listed Boron Carbide (CAS # 12069-32-8).

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): Boron Carbide is not on the California Proposition 65 Lists.

ANSI LABELING (Z129.1; Provided to Summarize Occupational Hazard Information): **WARNING!** CAUSES IRRITATION BY ALL ROUTES OF EXPOSURE. MAY BE HARMFUL IF INGESTED OR INHALED. MAY BE FATAL IF INGESTED. FINELY DIVIDED DUSTS CAN POSE HAZARD FOR AN AIR-DUST EXPLOSION. AVOID EXPOSURE TO SPARK OR OPEN FLAME IF MATERIAL ARE THOROUGHLY DISPERSED IN AIR. Do not taste or swallow. Do not get on skin, in eyes, or on clothes. Do not breathe dusts or particulates. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves and goggles. Use in accordance with the Material Safety Data Sheet.

FIRST-AID:
IF INHALED, remove to fresh air. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. If breathing is difficult, give oxygen. Call a physician.
IN CASE OF CONTACT, immediately flush eyes or skin with water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician. Wash clothing before reuse. (Discard contaminated shoes).

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY: Boron 11B Carbide (CAS # 200443-95-4) is not listed on the DSL or NDSL Inventories. The related material Boron Carbide (CAS # 12069-32-8) is listed on the DSL Inventory.

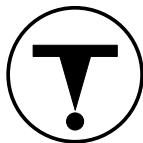
OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION AGENCY (CEPA) PRIORITY SUBSTANCES LISTS: Boron Carbide is not on the CEPA priority substances lists.

15. REGULATORY INFORMATION (Continued)

ADDITIONAL CANADIAN REGULATIONS (continued):

CANADIAN WHMIS CLASSIFICATION and SYMBOLS: **Class D2B:** Toxic Material/Immediate and Serious Effects-Chronic Effects



EUROPEAN COMMUNITY INFORMATION FOR PRODUCT:

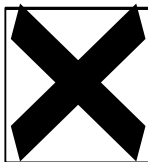
EU LABELING AND CLASSIFICATION: Boron 11B Carbide does not have a specific classification under EU regulations. The following is a self-classification, as defined by the European Union Council Directives 67/548/EEC and 93/112/EEC.

EU CLASSIFICATION: [Xn]: Harmful. [Xi]: Irritant.

EU RISK PHRASES: [R: 20/22]: Harmful by inhalation and if swallowed. [R: 36/37]: Irritating to eyes and respiratory system.

EU SAFETY PHRASES: [S: 2]: Keep out of reach of children. (*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.*) [S: 22]: Do not breathe dust. [S: 36/37/39]: Wear suitable protective clothing, gloves and eye/face protection. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S: 53]: Avoid exposure- obtain special instructions before use. Refer to special instructions/Safety data sheets.

EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOLS:



16. OTHER INFORMATION

PREPARED BY:

CHEMICAL SAFETY ASSOCIATES, INC.
PO Box 3519, La Mesa, CA 91944-3519
(619) 670-0609

The information contained herein is furnished without warranty of any kind. Persons using this product should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of this material, the safety of health of employees and customers and the protection of the environment.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these, which are commonly used, include the following:

CAS #: This is the Chemical Abstract Service Number that uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

CEILING LEVEL: The concentration that shall not be exceeded during any part of the working exposure.

DFG MAK Germ Cell Mutagen Categories: **1:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed humans. **2:** Germ cell mutagens which have been shown to increase the mutant frequency in the progeny of exposed mammals. **3A:** Substances which have been shown to induce genetic damage in germ cells of human or animals, or which produce mutagenic effects in somatic cells of mammals *in vivo* and have been shown to reach the germ cells in an active form. **3B:** Substances which are suspected of being germ cell mutagens because of their genotoxic effects in mammalian somatic cell *in vivo*; in exceptional cases, substances for which there are no *in vivo* data, but which are clearly mutagenic *in vitro* and structurally related to known *in vivo* mutagens. **4:** Not applicable (Category 4 carcinogenic substances are those with non-genotoxic mechanisms of action. By definition, germ cell mutagens are genotoxic. Therefore, a Category 4 for germ cell mutagens cannot apply. At some time in the future, it is conceivable that a Category 4 could be established for genotoxic substances with primary targets other than DNA [e.g. purely aneugenic substances] if research results make this seem sensible.) **5:** Germ cell mutagens, the potency of which is considered to be so low that, provided the MAK value is observed, their contribution to genetic risk for humans is expected not to be significant.

EXPOSURE LIMITS IN AIR (continued):

DFG MAK Pregnancy Risk Group Classification: **Group A:** A risk of damage to the developing embryo or fetus has been unequivocally demonstrated. Exposure of pregnant women can lead to damage of the developing organism, even when MAK and BAT (Biological Tolerance Value for Working Materials) values are observed. **Group B:** Currently available information indicates a risk of damage to the developing embryo or fetus must be considered to be probable. Damage to the developing organism cannot be excluded when pregnant women are exposed, even when MAK and BAT values are observed. **Group C:** There is no reason to fear a risk of damage to the developing embryo or fetus when MAK and BAT values are observed. **Group D:** Classification in one of the groups A-C is not yet possible because, although the data available may indicate a trend, they are not sufficient for final evaluation.

IDLH-Immediately Dangerous to Life and Health: This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

LOQ: Limit of Quantitation.

MAK: Federal Republic of Germany Maximum Concentration Values in the workplace.

NE: Not Established. When no exposure guidelines are established, an entry of NE is made for reference.

NIC: Notice of Intended Change.

DEFINITIONS OF TERMS (Continued)

EXPOSURE LIMITS IN AIR (continued):

NIOSH CEILING: The exposure that shall not be exceeded during any part of the workday. If instantaneous monitoring is not feasible, the ceiling shall be assumed as a 15-minute TWA exposure (unless otherwise specified) that shall not be exceeded at any time during a workday.

NIOSH RELs: NIOSH's Recommended Exposure Limits.

PEL-Permissible Exposure Limit: OSHA's Permissible Exposure Limits. This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL that was vacated by Court Order.

SKIN: Used when there is a danger of cutaneous absorption.

STEL-Short Term Exposure Limit: Short Term Exposure Limit, usually a 15-minute time-weighted average (TWA) exposure that should not be exceeded at any time during a workday, even if the 8-hr TWA is within the TLV-TWA, PEL-TWA or REL-TWA.

TLV-Threshold Limit Value: An airborne concentration of a substance that represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour.

TWA-Time Weighted Average: Time Weighted Average exposure concentration for a conventional 8-hr (TLV, PEL) or up to a 10-hr (REL) workday and a 40-hr workweek.

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS:

This rating system was developed by the National Paint and Coating Association and has been adopted by industry to identify the degree of chemical hazards.

HEALTH HAZARD:

0 (Minimal Hazard): No significant health risk, irritation of skin or eyes not anticipated. *Skin Irritation:* Essentially non-irritating. PII or Draize = "0". *Eye Irritation:* Essentially non-irritating, or minimal effects which clear in < 24 hours [e.g. mechanical irritation]. Draize = "0". *Oral Toxicity LD₅₀ Rat.* < 5000 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit.* < 2000 mg/kg. *Inhalation Toxicity 4-hrs LC₅₀ Rat.* < 20 mg/L.; **1 (Slight Hazard):** Minor reversible injury may occur; slightly or mildly irritating. *Skin Irritation:* Slightly or mildly irritating. *Eye Irritation:* Slightly or mildly irritating. *Oral Toxicity LD₅₀ Rat.* > 500-5000 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit.* > 1000-2000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat.* > 2-20 mg/L.; **2 (Moderate Hazard):** Temporary or transitory injury may occur. *Skin Irritation:* Moderately irritating; primary irritant; sensitizer. PII or Draize > 0, < 5. *Eye Irritation:* Moderately to severely irritating and/or corrosive; reversible corneal opacity; corneal involvement or irritation clearing in 8-21 days. Draize > 0, ≤ 25. *Oral Toxicity LD₅₀ Rat.* > 50-500 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit.* > 200-1000 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat.* > 0.5-2 mg/L.; **3 (Serious Hazard):** Major injury likely unless prompt action is taken and medical treatment is given; high level of toxicity; corrosive. *Skin Irritation:* Severely irritating and/or corrosive; may destroy dermal tissue, cause skin burns, dermal necrosis. PII or Draize > 5-8 with destruction of tissue. *Eye Irritation:* Corrosive, irreversible destruction of ocular tissue; corneal involvement or irritation persisting for more than 21 days. Draize > 80 with effects irreversible in 21 days. *Oral Toxicity LD₅₀ Rat.* > 1-50 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit.* > 20-200 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat.* > 0.05-0.5 mg/L.; **4 (Severe Hazard):** Life-threatening; major or permanent damage may result from single or repeated exposure. *Skin Irritation:* Not appropriate. Do not rate as a "4", based on skin irritation alone. *Eye Irritation:* Not appropriate. Do not rate as a "4", based on eye irritation alone. *Oral Toxicity LD₅₀ Rat.* ≤ 1 mg/kg. *Dermal Toxicity LD₅₀Rat or Rabbit.* ≤ 20 mg/kg. *Inhalation Toxicity LC₅₀ 4-hrs Rat.* ≤ 0.05 mg/L.

FLAMMABILITY HAZARD:

0 (Minimal Hazard-Materials) that will not burn in air when exposure to a temperature of 815.5°C [1500°F] for a period of 5 minutes.; **1 (Slight Hazard-Materials)** that must be pre-heated before ignition can occur. Material require considerable pre-heating, under all ambient temperature conditions before ignition and combustion can occur, Including: Materials that will burn in air when exposed to a temperature of 815.5°C (1500°F) for a period of 5 minutes or less; Liquids, solids and semisolids having a flash point at or above 93.3°C [200°F] (e.g. OSHA Class IIIB, or; Most ordinary combustible materials [e.g. wood, paper, etc.];

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):**FLAMMABILITY HAZARD (continued):**

2 (Moderate Hazard-Materials) that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not, under normal conditions, form hazardous atmospheres in air, but under high ambient temperatures or moderate heating may release vapor in sufficient quantities to produce hazardous atmospheres in air, Including: Liquids having a flash-point at or above 37.8°C [100°F]; Solid materials in the form of course dusts that may burn rapidly but that generally do not form explosive atmospheres; Solid materials in a fibrous or shredded form that may burn rapidly and create flash fire hazards (e.g. cotton, sisal, hemp; Solids and semisolids that readily give off flammable vapors.); **3 (Serious Hazard- Liquids and solids)** that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures, or, unaffected by ambient temperature, are readily ignited under almost all conditions, including: Liquids having a flash point below 22.8°C [73°F] and having a boiling point at or above 38°C [100°F] and below 37.8°C [100°F] [e.g. OSHA Class IB and IC]; Materials that on account of their physical form or environmental conditions can form explosive mixtures with air and are readily dispersed in air [e.g., dusts of combustible solids, mists or droplets of flammable liquids]; Materials that burn extremely rapidly, usually by reason of self-contained oxygen [e.g. dry nitrocellulose and many organic peroxides]; **4 (Severe Hazard-Materials)** that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air, and which will burn readily, including: Flammable gases; Flammable cryogenic materials; Any liquid or gaseous material that is liquid while under pressure and has a flash point below 22.8°C [73°F] and a boiling point below 37.8°C [100°F] [e.g. OSHA Class IA; Material that ignite spontaneously when exposed to air at a temperature of 54.4°C [130°F] or below [e.g. pyrophoric].

PHYSICAL HAZARD:

0 (Water Reactivity): Materials that do not react with water. *Organic Peroxides:* Materials that are normally stable, even under fire conditions and will not react with water. *Explosives:* Substances that are Non-Explosive. *Unstable Compressed Gases:* No Rating. *Pyrophorics:* No Rating. *Oxidizers:* No "0" rating allowed. *Unstable Reactives:* Substances that will not polymerize, decompose, condense or self-react.; **1 (Water Reactivity):** Materials that change or decompose upon exposure to moisture. *Organic Peroxides:* Materials that are normally stable, but can become unstable at high temperatures and pressures. These materials may react with water, but will not release energy. *Explosives:* Division 1.5 & 1.6 substances that are very insensitive explosives or that do not have a mass explosion hazard. *Compressed Gases:* Pressure below OSHA definition. *Pyrophorics:* No Rating. *Oxidizers:* Packaging Group III; *Solids:* any material that in either concentration tested, exhibits a mean burning time less than or equal to the mean burning time of a 3:7 potassium bromate/cellulose mixture and the criteria for Packing Group I and II are not met. *Liquids:* any material that exhibits a mean pressure rise time less than or equal to the pressure rise time of a 1:1 nitric acid (65%)/cellulose mixture and the criteria for Packing Group I and II are not met. *Unstable Reactives:* Substances that may decompose, condense or self-react, but only under conditions of high temperature and/or pressure and have little or no potential to cause significant heat generation or explosive hazard. Substances that readily undergo hazardous polymerization in the absence of inhibitors.; **2 (Water Reactivity):** Materials that may react violently with water. *Organic Peroxides:* Materials that, in themselves, are normally unstable and will readily undergo violent chemical change, but will not detonate. These materials may also react violently with water. *Explosives:* Division 1.4 – Explosive substances where the explosive effect are largely confined to the package and no projection of fragments of appreciable size or range are expected. An external fire must not cause virtually instantaneous explosion of almost the entire contents of the package. *Compressed Gases:* Pressurized and meet OSHA definition but < 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics:* No Rating. *Oxidizers:* Packaging Group II *Solids:* any material that, either in concentration tested, exhibits a mean burning time of less than or equal to the mean burning time of a 2:3 potassium bromate/cellulose mixture and the criteria for Packing Group I are not met. *Liquids:* any material that exhibits a mean pressure rise time less than or equal to the pressure rise of a 1:1 aqueous sodium chlorate solution (40%)/cellulose mixture and the criteria for Packing Group I are not met.

DEFINITIONS OF TERMS (Continued)

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM HAZARD RATINGS (continued):

PHYSICAL HAZARD (continued):

2 (continued): Unstable Reactives: Substances that may polymerize, decompose, condense, or self-react at ambient temperature and/or pressure, but have a low potential for significant heat generation or explosion. Substances that readily form peroxides upon exposure to air or oxygen at room temperature); **3 (Water Reactivity):** Materials that may form explosive reactions with water. *Organic Peroxides:* Materials that are capable of detonation or explosive reaction, but require a strong initiating source, or must be heated under confinement before initiation; or materials that react explosively with water. *Explosives:* Division 1.2 – Explosive substances that have a fire hazard and either a minor blast hazard or a minor projection hazard or both, but do not have a mass explosion hazard. *Compressed Gases:* Pressure \geq 514.7 psi absolute at 21.1°C (70°F) [500 psig]. *Pyrophorics:* No Rating. *Oxidizers:* Packing Group I *Solids:* any material that, in either concentration tested, exhibits a mean burning time less than the mean burning time of a 3:2 potassium bromate/cellulose mixture. *Liquids:* Any material that spontaneously ignites when mixed with cellulose in a 1:1 ratio, or which exhibits a mean pressure rise time less than the pressure rise time of a 1:1 perchloric acid (50%)/cellulose mixture. *Unstable Reactives:* Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a moderate potential to cause significant heat generation or explosion.); **4 (Water Reactivity):** Materials that react explosively with water without requiring heat or confinement. *Organic Peroxides:* Materials that are readily capable of detonation or explosive decomposition at normal temperature and pressures. *Explosives:* Division 1.1 & 1.2-explosive substances that have a mass explosion hazard or have a projection hazard. A mass explosion is one that affects almost the entire load instantaneously. *Compressed Gases:* No Rating. *Pyrophorics:* Add to the definition of Flammability “4”. *Oxidizers:* No “4” rating. *Unstable Reactives:* Substances that may polymerize, decompose, condense or self-react at ambient temperature and/or pressure and have a high potential to cause significant heat generation or explosion

NATIONAL FIRE PROTECTION ASSOCIATION HAZARD RATINGS:

HEALTH HAZARD: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury).

FLAMMABILITY HAZARD: **0** Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand. **1** Materials that must be preheated before ignition can occur. Materials in this degree require considerable preheating, under all ambient temperature conditions, before ignition and combustion can occur. **2** Materials that must be moderately heated or exposed to relatively high ambient temperatures before ignition can occur. Materials in this degree would not under normal conditions form hazardous atmospheres with air, but under high ambient temperatures or under moderate heating could release vapor in sufficient quantities to produce hazardous atmospheres with air. **3** Liquids and solids that can be ignited under almost all ambient temperature conditions. Materials in this degree produce hazardous atmospheres with air under almost all ambient temperatures or, though unaffected by ambient temperatures, are readily ignited under almost all conditions. **4** Materials that will rapidly or completely vaporize at atmospheric pressure and normal ambient temperature or that are readily dispersed in air and will burn readily.

INSTABILITY HAZARD: **0** Materials that in themselves are normally stable, even under fire conditions. **1** Materials that in themselves are normally stable, but that can become unstable at elevated temperatures and pressures. **2** Materials that readily undergo violent chemical change at elevated temperatures and pressures. **3** Materials that in themselves are capable of detonation or explosive decomposition or explosive reaction, but that require a strong initiating source or that must be heated under confinement before initiation. **4** Materials that in themselves are readily capable of detonation or explosive decomposition or explosive reaction at normal temperatures and pressures.

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (NFPA). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** **BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

ECOLOGICAL INFORMATION:

EC is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. **TL_m** = median threshold limit; Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

U.S. and CANADA:

ACGIH: American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. This section explains the impact of various laws and regulations on the material. **EPA** is the U.S. Environmental Protection Agency. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **DOT** and **TC** are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (**SARA**); the Canadian Domestic/Non-Domestic Substances List (**DSL/NDL**); the U.S. Toxic Substance Control Act (**TSCA**); Marine Pollutant status according to the **DOT**; the Comprehensive Environmental Response, Compensation, and Liability Act (**CERCLA** or **Superfund**); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label. **OSHA** - U.S. Occupational Safety and Health Administration. **The DFG:** This is the Federal Republic of Germany's Occupation Health Agency, similar to the U.S. OSHA. **EC** is the European Community (formerly known as the **EEC**, European Economic Community). **EINECS:** This is the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning the Carriage of Dangerous Goods by Rail. **AICS** is the Australian Inventory of Chemical Substances. **MITI** is the Japanese Minister of International Trade and Industry.