1. PRODUCT AND COMPANY IDENTIFICATION

Product Name	**Boron Oxide**
Chemical Formula	B_2O_3
Molecular Weight	69.62
CAS No.	1303-86-2
Recommended Use	Nuclear technology. One or more components in this material are approved for specific commercial uses under a US EPA Low Volume Exemption. Approved commercial use: Resistive dopant for silicon metals.
Synonyms	Boric acid anhydride, boron sesquioxide, boron trioxide
Supplier Address*	ISOFLEX USA PO Box 29475 San Francisco CA 94129 United States
Telephone	+1 415-440-4433
Fax	+1 415-563-4433
Emergency Phone Number (both supplier and manufacturer)	Infotrac/ +1 800-535-5053 *May include subsidiaries or affiliate companies/divisions
Email	iusa@isoflex.com
Website	www.isoflex.com
Preparation Information	ISOFLEX USA Product Safety +1 415-440-4433

2. HAZARDS IDENTIFICATION

Emergency Overview

This material is an odorless, dark gray granular or flake 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 and/or gastrointestinal system, as well as liver and/or renal damage.
Flammability Hazards	This material 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	This material 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.

Emergency Overview:

GHSOB Health Hazard: **H360** - May damage fertility or the unborn child.

Classification according to Directive 67/548/EEC or Directive 1999/45/EC:
T: Toxic
R60-61: May impair fertility. May cause harm to the unborn child.

Labeling according to EU guidelines:
Code letter and hazard designation of product: **T** Toxic
Risk phrases: **60** - May impair fertility, **61** - May cause harm to the unborn child
Safety phrases: **53** - Avoid exposure - obtain special instructions before use. **45** - In case of accident or if you feel unwell, seek medical advice immediately.

NFPA Ratings: (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)
Health Hazard = 1 **Flammability = 0** **Reactivity = 0**

HMIS Ratings: (0 = Minimal; 1 = Slight; 2 = Moderate; 3 = Serious; 4 = Severe)
Health Hazard = 1 **Flammability = 0** **Physical Hazard = 0**

HEALTH HAZARD	1
FLAMMABILITY	0
PHYSICAL HAZARD	0

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 this material 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 — This material may be absorbed via abraded or damaged skin. Symptoms may include those described under "Ingestion” and “Other Health Effects.”

Ingestion — Ingestion of this material 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.

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:

Acute	Acute exposure by all routes may cause irritation of exposed tissues.
Chronic	Chronic exposure to this material can cause boron poisoning with adverse symptoms to the central nervous system, skin, kidneys, blood system and liver. See Section 10 (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

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3. COMPOSITION/INFORMATION ON INGREDIENTS

Product Name	Boron Oxide
Chemical Formula	B_2O_3
Molecular Weight	69.62
CAS No.	1303-86-2

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4. FIRST AID MEASURES

General	Victim(s) must be taken for medical attention. Rescuers should be taken for medical attention if necessary. Take copy of label and SDS 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	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 Contact	If this material enters the eyes, open contaminated individual's eyes 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 kidney disorders, liver disorders, nervous system disorders and skin disorders may be aggravated by overexposure to this product.

Note to Physician:	Treatment is purely symptomatic. Plasma volume should be maintained by infusion of copious amounts of appropriate fluid.

5. FIREFIGHTING MEASURES

Flash Point	Not applicable
Autoignition Temperature	Not applicable
Flammable Limits (in Air by Volume) %l:	
Lower Limit:	Not applicable
Upper Limit:	Not applicable
Fire Extinguishing Materials:	Material will not burn. Non-combustible. 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	This material 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. Interaction of powdered boron and steam may become violent at red heat. Highly exothermic reactions with water might become combustive or explosive processes at sufficiently high temperatures and pressures.
Protective Equipment	Wear self-contained respirator. Wear fully protective impervious suit.

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 the event of large accidental spill, evacuate area. Eliminate all ignition sources if safe to do so. Use only non-sparking tools. Ventilate the area with fresh air. In case of a spill, clear the affected area and protect personnel. For small releases, clean up spilled liquid wearing gloves, goggles, face shield and suitable body protection. The minimum Personal Protective Equipment recommended for response to non-incidental 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. Sweep up or vacuum spilled solid (an explosion-proof vacuum should be used). Decontaminate the area thoroughly. 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 or those of EU Member States (see Section 13, Disposal Considerations).

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. Avoid contact with oxidizing agents (e.g. chlorine, chromic acid etc.) Dust deposits should not be allowed to accumulate on surfaces because of the potential for secondary explosions. Use in a well-ventilated location. Wipe down area routinely to avoid the accumulation of dusts of this product. Remove contaminated clothing immediately.

Keep container tightly sealed. Store in cool, dry place in tightly closed containers. Ensure good ventilation at the workplace. Store away from heat, acids and oxidizing agents.

This product is not flammable.

Conditions for Safe Storage

No special requirements. Store away from water/moisture. This product is hygroscopic. Keep container tightly sealed. Protect from humidity and water.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Additional Information about Design of Technical Systems**:**

Properly-operating chemical fume hood designed for hazardous chemicals and having an average face velocity of at least 100 feet per minute. Provide local exhaust to control exposure near the source and to prevent the escape of dust into work area.

No occupational exposure limit values exist for any of the components.

Personal Protective Equipment

General protective and hygenic measures: The usual precautionary measures for handling chemicals should be followed. Keep away from foodstuffs, beverages and feed. Remove all soiled and contaminated clothing immediately. Wash hands before breaks and at the end of work day. Avoid contact with eyes and skin.

Skin Protection

Wear protective gloves and clean body-covering clothing.

Eye Protection

Use chemical safety goggles. Maintain eye wash fountain and quick-drench facilities in work area.

Respiratory Protection

Use NIOSH-certified particulate respirator with an assigned protection factor of 10.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

This material is an odorless, dark gray granular or flake solid powder.

Safety Data

Solubility:	36 grams/liter @ 25 °C
Density:	2.46
pH:	No information found
% Volatiles by volume @ 21 °C:	0
Boiling Point:	Not applicable
Melting Point:	2300 °C
Vapor Density (Air=1):	No information found
Vapor Pressure (mm Hg):	0.12 mm Hg @ 2140 °C
Evaporation Rate (BuAc=1):	No information found
Specific Gravity:	2.35

10. STABILITY AND REACTIVITY

Stability	This material may be reactive with certain agents under certain conditions. Chemically stable.
Decomposition Products	Products of thermal decomposition include boron oxides.
Materials with which Substance Is Incompatible	May react violently on contact with bromine pentafluoride. Material is corrosive to metals in the presence of oxygen.
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.

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11. TOXICOLOGICAL INFORMATION

Acute Toxicity

Ingestion	No data available
Calculated Acute Toxicity	Estimate > 5,000 mg/kg

Primary irritant effect:

Inhalation	Respiratory tract irritation: signs/symptoms may include cough, sneezing, nasal discharge, headache, hoarseness, and nose and throat pain.
Skin	May cause irritation. Signs/symptoms may include abrasion, redness, pain and itching.
Eyes	May cause irritation. Signs/symptoms may include pain, redness, tearing and corneal abrasion.
Ingestion	Gastrointestinal irritation. Signs/symptoms may include abdominal pain, stomach upset, nausea, vomiting and diarrhea.
Sensitization	No sensitizing effects known.

The Registry of Toxic Effects of Chemical Substances (RTECS) reports the following effects in laboratory animals:

Kidney, Ureter, Bladder - Urine volume increased

Kidney, Ureter, Bladder - Other changes in urine composition

Kidney, Ureter, Bladder - Incontinence

Sense Organs and Special Senses (Olfaction) - Effect, not otherwise specified

Lungs, Thorax or Respiration - Other changes

Nutritional and Gross Metabolic - Weight loss or decreased weight gain

Subacute to Chronic Toxicity:

Boron oxide has a relatively low acute toxicity. Swallowing large amounts may cause gastrointestinal symptoms.

Additional toxicological information:

To the best of our knowledge, the acute and chronic toxicity of this substance is not fully known.

EPA-I: Data are inadequate for an assessment of human carcinogenic potential. May impair fertility. May cause harm to the unborn child.

12. ECOLOGICAL INFORMATION

Toxicity

Toxicity to Fish	Static test LC50 - *Pimephales promelas* (fathead minnow) – 79.7 mg/l - 96h
Toxicity to Daphnia *and Other Aquatic Invertebrates*	Static test LC50 – *Daphnia dubia* (water flea) – 115 mg/l – 48h (OECD Test Guideline 202)
	Static test LC50 – *Daphnia magna* (water flea) – 133 mg/l – 48 h
Toxicity to Algae	EC50 – *Selenastrum capricornutum* (green algae) – 52.5 mg/l – 74.5 h (OECD Test Guideline 201)
Toxicity to Bacteria	Respiration inhibition EC50 – Sludge Treatment - > 175 mg/l – 3 h
Persistence and Degradability	No data available
Bioaccumulative Potential	No data available
Mobility in Soil	No data available
Results of PBT and vPvB Assessment	PBT/vPvB assessment not available, as chemical safety assessment not required/not conducted
Other Adverse Effects	No data available

13. DISPOSAL CONSIDERATIONS

Waste Treatment Methods	Consult state, local or national regulations to ensure proper disposal.
Contaminated Packaging	Disposal must be made according to official regulations.

14. TRANSPORT INFORMATION

DOT	Not a hazardous material for transport.
IMDG	Not a hazardous material for transport.
IATA	Not a hazardous material for transport.

15. REGULATORY INFORMATION

SARA 302 Components	No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.
SARA 313 Components	This material does not contain any chemical components with known CAS numbers that exceed the threshold (de minimis) reporting levels established by SARA Title III, Section 313.
SARA 311/312 Hazards	Chronic Health Hazard
Massachusetts Right to Know Components	Diboron trioxide / CAS No. 1303-86-2 / Revision Date: 1993-04-24
Pennsylvania Right to Know Components	Diboron trioxide / CAS No. 1303-86-2 / Revision Date: 1993-04-24
New Jersey Right to Know Components	Diboron trioxide / CAS No. 1303-86-2 / Revision Date: 1993-04-24
California Prop. 65 Components	This product does not contain any chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Prepared By	ISOFLEX USA PO Box 29475 San Francisco CA 94129 United States
Issuing Date	September 15, 2014
Revision Date	August 01, 2021
Revision Number	3
Revision Note	Required review and update

ISOFLEX USA's Commonly Used Abbreviations and Acronyms*

ACGIH	American Conference of Governmental Industrial Hygienists
ADR	European Agreement Concerning the International Carriage of Dangerous Goods by Road
ALARA	As Low As Is Reasonably Achievable
AMU	Atomic Mass Unit
ANSI	American National Standards Institute
BLS	Basic Life Support
CAM	Continuous Air Monitor
CAS	Chemical Abstracts Service (division of the American Chemical Society)
CEN	European Committee for Standardization
CERCLA	Comprehensive Environmental Response Compensation and Liability Act
CLP	Classification, Labelling and Packaging (European Union)
CPR	Controlled Products Regulations (Canada)
CWA	Clean Water Act (USA)
DAC	Derived Air Concentration (USA)
DOE	United States Department of Energy (USA)
DOT	United States Department of Transportation (USA)
DSL	Domestic Substances List (Canada)
EC50	Half Maximal Effective Concentration
EINECS	European Inventory of Existing Commercial Chemical Substances
EHS	Environmentally Hazardous Substance
ELINCS	European List of Notified Chemical Substances
EMS	Emergency Response Procedures for Ships Carrying Dangerous Goods
EPA	Environmental Protection Agency (USA)
EPCRA	Emergency Planning and Community Right-To-Know Act (EPCRA) of 1986
GHS	Globally Harmonized System
HMIS	Hazardous Materials Identification System (USA)
IARC	International Agency for Research on Cancer
IATA	International Air Transport Association
IBC	Intermediate Bulk Containers
ICAO	International Civil Aviation Organization
IDLH	Immediately Dangerous to Life or Health
IMDG	International Maritime Code for Dangerous Goods
LC50	Lethal concentration, 50 percent
LD50	Lethal dose, 50 percent
LDLO	Lethal Dose Low
LOEC	Lowest-Observed-Effective Concentration
MARPOL	International Convention for the Prevention of Pollution from Ships
MSHA	Mine Safety and Health Administration (USA)
NCRP	National Council on Radiation Protection & Measurements (USA)
NDSL	Non-Domestic Substances List (Canada)
NFPA	National Fire Protection Association (USA)
NIOSH	National Institute for Occupational Safety and Health (USA)
NOEC	No Observed Effect Concentration
N.O.S.	Not Otherwise Specified
NRC	Nuclear Regulatory Commission (USA)

NTP	National Toxicology Program (USA)
OSHA	Occupational Safety and Health Administration (USA)
PBT	Persistent Bioaccumulative and Toxic Chemical
PEL	Permissible Exposure Limit
PIH	Poisonous by Inhalation Hazard
RCRA	Resource Conservation and Recovery Act (USA)
RCT	Radiation Control Technician
REACH	Registration, Evaluation, Authorisation and Restriction of Chemicals (Europe)
RID	Regulations Concerning the International Transport of Dangerous Goods by Rail
RTECS	Registry of Toxic Effects of Chemical Substances
SARA	Superfund Amendments and Reauthorization Act (USA)
TDG	Transportation of Dangerous Goods (Canada)
TIH	Toxic by Inhalation Hazard
TLV	Threshold Limit Value
TPQ	Threshold Planning Quantity
TSCA	Toxic Substances Control Act
TWA	Time Weighted Average
UN	United Nations (Number)
VOC	Volatile Organic Compound
vPvB	Very Persistent Very Bioaccumulative Chemical
WGK	Wassergefährdungsklassen (Germany: Water Hazard Classes)
WHMIS	Workplace Hazardous Materials Information System

*One or more of the above-listed items may not appear in this document.

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