



Boric Oxide

Anhydrous Boric Acid

Material Safety Data Sheet
DATE OF ISSUE May 2000
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1 Chemical product and company identification

Product name: Boric Oxide
Grade: Technical
Product use: Industrial manufacturing
Chemical formula: B₂O₃
Chemical name/synonyms: Boric oxide, Boron trioxide, diboron trioxide, anhydrous boric acid
Chemical family: Inorganic borates
CAS registry number: 1303-86-2

(Refer to Section 15 for TSCA/DSL Chemical Inventory listing)

MANUFACTURER:

U.S. Borax Inc.
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Valencia, CA 91355-1847

EMERGENCY PHONE NUMBERS:

24 Hr. Medical Info. Service . . . (661) 284-5200
Chemtrec (Spills): (800) 424-9300

2 Composition/information on ingredients

This product contains greater than 99 percent (%) Boric oxide, B₂O₃, which is hazardous under the OSHA Hazard Communication Standard and under the Canadian Controlled

Products Regulations of the Hazardous Products Act (WHMIS), based on animal chronic toxicity studies. Refer to Sections 3 and 11 for details on hazards.

3 Hazard identification

Emergency overview

Boric Oxide is a white, odorless, powder substance that is not flammable, combustible, or explosive and has low acute oral and dermal toxicity. Reaction with water results in the liberation of heat (75.94kJ/mol) and the formation of boric acid.

Potential ecological effects

Large amounts of Boric Oxide can be harmful to plants and other species. Therefore, releases to the environment should be minimized.

Potential health effects

Routes of exposure: Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because Boric Oxide is poorly absorbed through intact skin.

Inhalation: Occasional mild irritation effects to the nose and throat may occur from inhalation of Boric Oxide dust at levels greater than 10 mg/m³.

Eye contact: Boric Oxide is non-irritating to the eyes in normal industrial use.

Skin contact: Boric Oxide does not cause irritation to intact skin.

Ingestion: Products containing Boric Oxide are not intended for ingestion. Boric Oxide has a low acute toxicity. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms.

Cancer: Boric Oxide is not a known carcinogen.

Reproductive/developmental: Animal ingestion studies in several species, at high doses, indicate that borates cause reproductive and developmental effects. A human study of occupational exposure to borate dust showed no adverse effect on reproduction.

Target organs: No target organ has been identified in humans. High dose animal ingestion studies indicate the testes are the target organs in male animals.

Signs and symptoms of exposure: Symptoms of accidental over-exposure to Boric Oxide might include nausea, vomiting and diarrhea, with delayed effects of skin redness and peeling. These symptoms have been associated with the accidental over-exposure to the chemically related substance boric acid. Refer to Section 11 for details on Toxicological data.

4 First aid measures

Inhalation: If symptoms such as nose or throat irritation are observed, remove person to fresh air.

Eye contact: Use eye wash fountain or fresh water to cleanse the eye. If irritation persists for more than 30 minutes, seek medical attention.

Skin contact: No treatment necessary because non-irritating.

Ingestion: Swallowing small quantities (one teaspoon) will cause no harm to healthy adults. If larger amounts are swallowed, give two glasses of water to drink and seek medical attention.

Note to physicians: Observation only is required for adult ingestion in the range of 4-8 grams of Boric Oxide. For ingestion of larger amounts, maintain adequate kidney function and force fluids. Gastric lavage is recommended for symptomatic patients only. Hemodialysis should be reserved for massive acute ingestion or patients with renal failure. Boron analyses of urine or blood are only useful for documenting exposure and should not be used to evaluate severity of poisoning or to guide treatment¹. Refer to Section 11 for details.



Boric Oxide

5 Firefighting measures

General hazard: None, because Boric Oxide is not flammable, combustible or explosive. The product is itself a flame retardant.

Extinguishing media: Any fire extinguishing media may be used on nearby fires.

Flammability classification (29 CFR 1910.1200): Non-flammable solid.

6 Accidental release measures

General: Boric Oxide is a water-soluble white powder that may, at high concentrations, cause damage to trees or vegetation by root absorption. (Refer to Ecological information, Section 12, for specific information.)

Land spill: Vacuum, shovel or sweep up Boric Oxide and place in containers for disposal in accordance with applicable local regulations. Avoid contamination of water bodies during cleanup and disposal. Personal protective equipment is not needed to cleanup land spills.

Spillage into water: Where possible, remove any intact containers from the water. Advise local water authority that none of the affected water should be used for irrigation or for the abstraction of potable water until natural dilution returns the boron value to its normal environmental background level. (Refer to Sections 12, 13 and 15 for additional information.) Boric Oxide is a non-hazardous waste when spilled or disposed of, as defined in the Resource Conservation and Recovery Act (RCRA) regulations (40 CFR 261). (Refer to Regulatory information, Section 15, for additional references.)

7 Handling and storage

General: No special handling precautions are required, but dry, indoor storage is recommended. To maintain package integrity and to minimize caking of the product, bags should be handled on a first-in, first-out basis. Good housekeeping procedures should be followed to minimize dust generation and accumulation.

Storage temperature: Ambient

Storage pressure: Atmospheric

Special sensitivity: Moisture (caking)

8 Exposure controls/personal protection

Engineering controls: Use local exhaust ventilation to keep airborne concentrations of Boric Oxide dust below permissible exposure levels.

Personal protection: Where airborne concentrations are expected to exceed exposure limits, NIOSH/MSHA certified respirators should be used. Eye goggles and gloves are not required for normal industrial exposures, but may be warranted if environment is excessively dusty.

Occupational exposure limits: Boric oxide is regulated by OSHA, Cal OSHA and ACGIH.

ACGIH/TLV: 10 mg/m³

Cal OSHA/PEL: 10 mg/m³

OSHA/PEL (total dust): 15 mg/m³

OSHA/PEL (respirable dust): 5 mg/m³

9 Physical and chemical properties

Appearance: White, odorless, crystalline solid

Specific gravity: 1.51

Vapor pressure: Negligible @ 20°C

Solubility in water: 4.0% @ 20°C

Heat of hydration: 75.94 kJ/mol (469 BTU/lb)
to boric acid (evolved)

Melting point: 450-465 °C (842-869°F) (heated in closed space)

pH @ 20°C: 5.1 (1.0% solution);

Molecular weight: 69.6

10 Stability and reactivity

General: Boric Oxide is a stable product, except for hydration with moisture.

Incompatible materials and conditions to avoid: Reaction with strong reducing agents, such as metal hydrides or alkali metals, will generate hydrogen gas, which could create an explosive hazard.

Hazardous decomposition: None.

11 Toxicological information

Acute toxicity

Ingestion: Low acute oral toxicity; LD₅₀ in rats is 1,970 to 2,100 mg/kg of body weight.

Skin/dermal: Low acute dermal toxicity; LD₅₀ in rabbits is greater than 2,000 mg/kg of body weight. Boric oxide is poorly absorbed through intact skin.

Inhalation: Rat inhalation studies with boric oxide at an exposure concentration of 77 mg/m³ did not indicate any acute toxicity effects.

Skin irritation: Non-irritant.

Eye irritation: Draize test in rabbits produced mild eye irritation effects. Many years of occupational exposure to Boric Oxide indicates no adverse effects on human eye. Therefore, Boric Oxide is not considered to be a human eye irritant in normal industrial use.

Sensitization: No experimental test data, however other borates, including boric acid, are not skin sensitizers.

Other

Reproductive/developmental toxicity: Animal feeding studies in rat, mouse and dog, at high doses, have demonstrated effects on fertility and testes². Studies with the chemically related boric acid in the rat, mouse and rabbit, at high doses, demonstrate developmental effects on the fetus, including fetal weight loss and minor skeletal variations^{3, 4}. The doses administered were many times in excess of those to which humans would normally be exposed⁵.

Carcinogenicity/mutagenicity: No evidence of carcinogenicity in mice⁶. No mutagenic activity was observed for boric acid in a battery of short-term mutagenicity assays.

Human data: Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to boric acid dust and sodium borate dust. A recent epidemiology study under the conditions of normal occupational exposure to borate dusts indicated no effect on fertility⁷.

12 Ecological information

Ecotoxicity data

General: Boron (B) is the element in boric oxide which is used by convention to report borate product ecological effects. It occurs naturally in sea-water at an average concentration of 5 mg B/L and generally occurs in fresh water at concentrations up to 1 mg B/L. In dilute aqueous solutions the predominant boron species present is undissociated boric acid. To convert boric oxide into the equivalent boron (B) content, multiply by 0.3105.

Phytotoxicity: Boron is an essential micronutrient for healthy growth of plants; however, it can be harmful to boron sensitive plants in high quantities. Care should be taken to minimize the amount of Boric Oxide released to the environment.

Algal toxicity:

Green algae, *Scenedesmus subspicatus*
96-hr EC₁₀ = 24 mg B/L[†]

Invertebrate toxicity⁸:

Daphnids, *Daphnia magna straus*
48-hr LC₅₀ = 133 mg B/L[‡]
21-day NOEC-LOEC = 6-13 mg B/L[‡]

Test substance: † sodium tetraborate
‡ boric acid

Fish toxicity:

Sea-water⁹:

Dab, *Limanda limanda*
96-hr LC₅₀ = 74 mg B/L[†]

Fresh water¹⁰:

Rainbow trout, *S. gairdneri* (embryo-larval stage)
24-day LC₅₀ = 150 mg B/L[‡]
32-day LC₅₀ = 100 mg B/L[‡]

Goldfish, *Carassius auratus* (embryo-larval stage)
7-day LC₅₀ = 46 mg B/L[‡]
3-day LC₅₀ = 178 mg B/L[‡]

Environmental fate data

Persistence/degradation: Boron is naturally occurring and ubiquitous in the environment. Boric Oxide decomposes in the environment to natural borate.

Octanol/water partition coefficient: Log P_{ow}: -0.7570 at 25°C. Boric oxide reacts with water to form boric acid.

Soil mobility: Boric Oxide is soluble in water and is leachable through normal soil.

13 Disposal considerations

Disposal guidance: Small quantities of Boric Oxide can usually be disposed of at landfill sites. No special disposal treatment is required, but local authorities should be consulted about any specific local requirements. Tonnage quantities of product should, if possible, be used for an appropriate application.

RCRA (40 CFR 261): Boric oxide is not listed under any sections of the Federal Resource Conservation and Recovery Act (RCRA).

NPRI (Canada): Boric oxide is not listed on the Canadian National Pollutant Release Inventory.

Refer to Section 15 for additional regulatory information.

14 Transport information

DOT hazardous classification: Boric oxide is not regulated by the U.S. Department of Transportation (DOT) and is therefore not considered a hazardous material/substance.

TDG Canadian transportation: Boric oxide is not regulated under Transportation of Dangerous Goods (TDG).

International transportation: Boric oxide has no UN Number, and is not regulated under international rail, road, water or air transport regulations.

15 Regulatory information

OSHA/Cal OSHA: This MSDS document meets the requirements of both OSHA (29 CFR 1910.1200) and Cal OSHA (Title 8 CCR 5194 (g)) hazard communication standards. Refer to Section 8 for regulatory exposure limits.

WHMIS classification: Boric oxide is classified as Class D-Division 2A under Canadian WHMIS guidelines.

Chemical inventory listing: Boric oxide, 1303-86-2, appears on several chemical inventory lists (including the EPA TSCA inventory, Canadian DSL, European EINECS, Japanese MITI, Australian and Korean lists) under the CAS No. representing this inorganic salt.

U.S. EPA TSCA Inventory	1303-86-2
Canadian DSL	1303-86-2
EINECS	215-125-8
South Korea	1-63
Japanese MITI	(1)-69

RCRA: Boric oxide is not listed as a hazardous waste under any sections of the Resource Conservation and Recovery Act (RCRA) or regulations (40 CFR 261 *et seq.*).

Superfund: CERCLA/SARA. Boric oxide is not listed under CERCLA or its 1986 amendments, SARA, including substances listed under Section 313 of SARA, Toxic Chemicals, 42 USC 11023, 40 CFR 372.65, Section 302 of SARA, Extremely Hazardous Substances, 42 USC 11002, 40 CFR 355, or the CERCLA Hazardous Substances list, 42 USC 9604, 40 CFR 302.

Safe Drinking Water Act (SDWA): Boric oxide is not regulated under the SDWA, 42 USC 300g-1, 40 CFR 141 *et seq.* Consult state and local regulations for possible water quality advisories regarding boron compounds.

Clean Water Act (CWA) (Federal Water Pollution Control Act): 33 USC 1251 *et seq.*

- Boric oxide is not itself a discharge covered by any water quality criteria of Section 304 of the CWA, 33 USC 1314.
- It is not on the Section 307 List of Priority Pollutants, 33 USC 1317, 40 CFR 129.
- It is not on the Section 311 List of Hazardous Substances, 33 USC 1321, 40 CFR 116.

Canadian drinking water guideline: An "Interim Maximum Acceptable Concentration" (IMAC) for boron is currently set at 5 mg B/L.

IARC: The International Agency for Research on Cancer (IARC) (a unit of the World Health Organization) does not list or categorize Boric oxide as a carcinogen.

NTP Biennial Report on Carcinogens: Boric oxide is not listed.

OSHA carcinogen: Boric oxide is not listed.

California Proposition 65: Boric oxide is not listed on the Proposition 65 list of carcinogens or reproductive toxicants.

Federal Food, Drug and Cosmetic Act: Pursuant to 21 CFR 175.105, 176.180 and 181.30, Boric Oxide is approved by the FDA for use in adhesive components of packaging materials, as a component of paper coatings on such materials, or for use in the manufacture thereof, which materials are expected to come in contact with dry food products.

Clean Air Act (Montreal Protocol): Boric Oxide was not manufactured with and does not contain any Class I or Class II ozone depleting substances.

16 Other information

References

- Litovitz T L, Norman S A, Veltri J C, Annual Report of the American Association of Poison Control Centers Data Collection System. *Am. J. Emerg. Med.* **4:** 427-458 (1986).
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- Fail *et al.*, *Fund. Appl. Toxicol.* **17:** 225-239 (1991).
- Price *et al.*, *J. Am. Coll. Toxicol.* **14:** (2), 173 (Abst. P-17) (1995).
- Murray F J, *Regul. Toxicol. Pharmacol.* (Dec. 1995).
- National Toxicology Program (NTP)—Toxicology and carcinogenesis studies of boric acid in B6C3F₁ mice, Tech. Report Ser. No. 324, U.S. Dept. of Health and Human Services. NIH Publ. No. 88-2580 (1987).
- Whorton *et al.*, *Occup. Environ. Med.* **51:** 761-767 (1994).
- Schöberl *et al.*, *Tenside Surfactants Detergents* **25:** 99-107 (1988).
- Hugman S J, Mance G, Water Research Centre Report 616-M (1983).
- Butterwick L, de Oude N, Raymond K, *Ecotoxicol. Environ. Safety* **17:** 339-371 (1989).

For general information on the toxicology of inorganic borates, see Patty's Industrial Hygiene and Toxicology, 4th Ed. Vol. II, (1994), Chap. 42, Boron; ECETOC Tech. Report No. 63 (1995).

Product label text hazard information*:

- Do not ingest.
- Ingestion may cause reproductive harm or birth defects based on animal data.
- Avoid contamination of food or feed.
- Not for use in food, drug, or pesticides[†].
- Refer to MSDS.
- KEEP OUT OF REACH OF CHILDREN.

*The WHMIS panel format is used for Canadian product.

National Fire Protection Assoc. (NFPA) classification:

Health	0
Flammability	0
Reactivity	0

Hazardous Materials Information Systems (HMIS):

Red: (Flammability)	0
Yellow: (Reactivity)	0
Blue: (Acute Health)	1*

*Chronic Effects

For further information contact:

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