

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Boron trichloride

Chemical formula : BCl₃

Synonyms : Boron trichloride, Boron Chloride, Trichloroborane

Product Use Description : General Industrial

Company : Air Products and Chemicals, Inc
7201 Hamilton Blvd.
Allentown, PA 18195-1501

Telephone : 1-800-345-3148 Chemicals
1-800-752-1597 Gases and Electronic Chemicals

Emergency telephone number : 800-523-9374 USA
01-610-481-7711 International

2. COMPOSITION/INFORMATION ON INGREDIENTS

Components	CAS Number	Concentration (Volume)
Boron trichloride	10294-34-5	100 %

Concentration is nominal. For the exact product composition, please refer to Air Products technical specifications.

3. HAZARDS IDENTIFICATION

Emergency Overview

Reacts with water to form corrosive acids.
Wear self-contained breathing apparatus and protective suit.
Direct contact with liquid can cause frostbite.
May react violently with water.
Do not breathe gas.
Corrosive to eyes, respiratory system and skin.
Compressed liquefied gas.

Potential Health Effects

Inhalation : Irritating to respiratory system. Can cause severe lung damage. May be fatal if inhaled. Delayed adverse effects possible. Prolonged exposure to small concentrations may result in pulmonary edema. Delayed fatal pulmonary edema possible.

Eye contact : May cause blindness. Irritating to eyes. Causes severe eye burns. May cause permanent eye injury.

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

Skin contact : Contact with liquid may cause cold burns/frost bite. Causes skin irritation. Causes skin burns.

Ingestion : Causes severe digestive tract burns.

Exposure Guidelines

Primary Routes of Entry : Inhalation
Eye and skin contact.

Target Organs : Kidney.
Teeth.
Eyes.
Respiratory tract.
Skin.

Symptoms : Irritating to eyes and respiratory system. Gum bleeding. Cough. Discoloration of teeth.

Aggravated Medical Condition

Acute or chronic respiratory conditions. Asthma.

Environmental Effects

Dangerous for the environment.

4. FIRST AID MEASURES

General advice : The potential for hydrogen chloride formation exists with every exposure, therefore its toxicity must be considered. Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped. Use chemically protective clothing.

Eye contact : In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Keep eye wide open while rinsing.

Skin contact : Flush with copious amounts of water until treatment is available. Immediate medical treatment is necessary as untreated wounds from corrosion of the skin heal slowly and badly.

Ingestion : Drink plenty of water. Do not induce vomiting. Never give anything by mouth to an unconscious person.

Inhalation : Move to fresh air. If breathing has stopped or is labored, give assisted respirations. Supplemental oxygen may be indicated. If the heart has stopped, trained personnel should begin cardiopulmonary resuscitation immediately. Mouth to mouth resuscitation is not recommended. If unconscious, place in recovery position and seek medical advice. In case of shortness of breath, give oxygen. Consult a doctor.

Notes to physician

Treatment : Liberation of hydrogen chloride may cause corrosive effects to the mucous

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

membranes. Swallowed, it may produce ulceration and possibly perforation in the upper alimentary tract. Mediastinitis or peritonitis and the complications thereof may develop. Massive overexposure to the vapor may cause delayed-onset pulmonary edema. Secondary infection may develop in the inflamed respiratory tract. Patients should be kept under observation. Aspirated material may produce lung injury. Emesis should not be induced mechanically or pharmacologically. If it is considered necessary to evacuate the stomach contents, this should be undertaken by means least likely to result in aspiration (e.g. in the presence of airway intubation). Caution should be taken to avoid perforation of an acutely inflamed or ulcerated area of the alimentary tract. Be alert to kidney involvement due to boron toxicity and concentration effects during excretion.

5. FIRE-FIGHTING MEASURES

- Suitable extinguishing media : All known extinguishing media can be used.
- Specific hazards : Product is nonflammable and does not support combustion. Upon exposure to intense heat or flame, cylinder will vent rapidly and or rupture violently. Use of water may result in the formation of very toxic aqueous solutions. Move away from container and cool with water from a protected position. Keep adjacent cylinders cool by spraying with large amounts of water until the fire burns itself out. If possible, stop flow of product. Most cylinders are designed to vent contents when exposed to elevated temperatures.
- Special protective equipment for fire-fighters : Use self-contained breathing apparatus and chemically protective clothing.

6. ACCIDENTAL RELEASE MEASURES

- Personal precautions : Evacuate personnel to safe areas. Ventilate the area. Approach suspected leak areas with caution. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits.
- Environmental precautions : Should not be released into the environment. Prevent further leakage or spillage if safe to do so. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous.
- Methods for cleaning up : Ventilate the area. Wash contaminated equipment or sites of leaks with copious quantities of water. Reduce vapor with fog or fine water spray.
- Additional advice : If possible, stop flow of product. Increase ventilation to the release area and monitor concentrations. If leak is from cylinder or cylinder valve, call the Air Products emergency telephone number. If the leak is in the user's system, close the cylinder valve, safely vent the pressure, and purge with an inert gas before attempting repairs.

7. HANDLING AND STORAGE

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

Handling

Use equipment rated for cylinder pressure. Cylinders should be stored upright with valve protection cap in place and firmly secured to prevent falling or being knocked over. Protect cylinders from physical damage; do not drag, roll, slide or drop. Do not allow storage area temperature to exceed 50°C (122°F). Only experienced and properly instructed persons should handle compressed gases. Before using the product, determine its identity by reading the label. Know and understand the properties and hazards of the product before use. When doubt exists as to the correct handling procedure for a particular gas, contact the supplier. Do not remove or deface labels provided by the supplier for the identification of the cylinder contents. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Leave valve protection caps in place until the container has been secured against either a wall or bench or placed in a container stand and is ready for use. Use an adjustable strap wrench to remove over-tight or rusted caps. Before connecting the container, check the complete gas system for suitability, particularly for pressure rating and materials. Before connecting the container for use, ensure that back feed from the system into the container is prevented. Ensure the complete gas system is compatible for pressure rating and materials of construction. Ensure the complete gas system has been checked for leaks before use. Employ suitable pressure regulating devices on all containers when the gas is being emitted to systems with lower pressure rating than that of the container. Never insert an object (e.g. wrench, screwdriver, pry bar, etc.) into valve cap openings. Doing so may damage valve, causing a leak to occur. Open valve slowly. If user experiences any difficulty operating cylinder valve discontinue use and contact supplier. Close container valve after each use and when empty, even if still connected to equipment. Never attempt to repair or modify container valves or safety relief devices. Damaged valves should be reported immediately to the supplier. Close valve after each use and when empty. Replace outlet caps or plugs and container caps as soon as container is disconnected from equipment. Do not subject containers to abnormal mechanical shocks which may cause damage to their valve or safety devices. Never attempt to lift a cylinder by its valve protection cap or guard. Do not use containers as rollers or supports or for any other purpose than to contain the gas as supplied. Never strike an arc on a compressed gas cylinder or make a cylinder a part of an electrical circuit. Keep container valve outlets clean and free from contaminants particularly oil and water. Do not smoke while handling product or cylinders. Never re-compress a gas or a gas mixture without first consulting the supplier. Never attempt to transfer gases from one cylinder/container to another. Always use backflow protective device in piping. Purge air from system before introducing gas. Purge system with dry inert gas (e.g. helium or nitrogen) before gas is introduced and when system is placed out of service. Avoid suckback of water, acid and alkalis. Installation of a cross purge assembly between the cylinder and the regulator is recommended. When returning cylinder install valve outlet cap or plug leak tight. Never use direct flame or electrical heating devices to raise the pressure of a container. Containers should not be subjected to temperatures above 50°C (122°F). Prolonged periods of cold temperature below -30°C (-20°F) should be avoided. Never attempt to increase liquid withdrawal rate by pressurizing the container without first checking with the supplier. Never permit liquefied gas to become trapped in parts of the system as this may result in hydraulic rupture.

Storage

Full containers should be stored so that oldest stock is used first. Containers should be stored in a purpose build compound which should be well ventilated, preferably in the open air. Observe all regulations and local requirements regarding storage of containers. Stored containers should be periodically checked for general condition and leakage. Local codes may have special requirements for toxic gas storage. Protect containers stored in the open against rusting and extremes of weather. Containers should not be stored in conditions likely to encourage corrosion. Containers should be stored in the vertical position and properly secured to prevent toppling. The container valves should be tightly closed and where appropriate valve outlets should be capped or plugged. Container valve guards or caps should be in place. Keep containers tightly closed in a cool, well-ventilated place. Full and empty cylinders should be segregated. Do not allow storage temperature to exceed 50°C (122°F). Return empty containers in a timely manner.

Technical measures/Precautions

Provide sufficient air exchange and/or exhaust in work rooms. Containers should be segregated in the storage

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

area according to the various categories (e.g. flammable, toxic, etc.) and in accordance with local regulations.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Engineering measures

Handle product only in closed system or provide appropriate exhaust ventilation at machinery.
Provide natural or explosion-proof ventilation adequate to ensure concentrations are kept below exposure limits.

Personal protective equipment

- Respiratory protection : Keep self contained breathing apparatus readily available for emergency use. Use self-contained breathing apparatus or positive pressure air line with mask and escape pack in areas where concentration is unknown or above the exposure limits. Users of breathing apparatus must be trained.
- Hand protection : Sturdy work gloves are recommended for handling cylinders. The breakthrough time of the selected glove(s) must be greater than the intended use period.
- Eye protection : Safety glasses recommended when handling cylinders. A full faceshield should be worn in addition to safety glasses when connecting, disconnecting or opening cylinders.
- Skin and body protection : Acid resistant gloves (e.g. butyl rubber, neoprene, polyethylene) and splash suit when connecting, disconnecting or opening cylinders. Safety shoes are recommended when handling cylinders. Encapsulated chemical protective suit in emergency situations.
- Special instructions for protection and hygiene : Ensure adequate ventilation, especially in confined areas. Provide good ventilation and/or local exhaust to prevent accumulation of concentrations above exposure limits.

9. PHYSICAL AND CHEMICAL PROPERTIES

- Form : Liquefied gas.
- Color : Gives off white fumes in moist air
- Odor : Pungent.
- Molecular Weight : 117.17 g/mol
- Relative vapor density : 4.045 (air = 1)
- Relative density : 1.3 (water = 1)
- Vapor pressure : 23.21 psia (1.60 bar) at 68 °F (20 °C)
- Density : 0.312 lb/ft³ (0.0050 g/cm³) at 70 °F (21 °C)
Note: (as vapor)

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

Specific Volume : 3.18 ft³/lb (0.1985 m³/kg) at 70 °F (21 °C)
Boiling point/range : 55 °F (12.8 °C)
Critical temperature : 354 °F (178.8 °C)
Melting point/range : -161 °F (-107 °C)
Water solubility : Hydrolyses.

10. STABILITY AND REACTIVITY

Stability : Stable under normal conditions.
Materials to avoid : Strong bases.
Alcohols.

11. TOXICOLOGICAL INFORMATION

Acute Health Hazard

Ingestion : No data is available on the product itself.
Inhalation : LC50 (1 h) : 2541 ppm
Species : Rat.
Skin. : No data is available on the product itself.

Chronic Health Hazard

Pregnant rats exposed for one hour to 300 ppm hydrochloric acid had a five-fold higher incidence of fetal death than control rats. In addition, the surviving rat pups showed disturbances in kidney function. Boron compounds (particularly boric acid) have caused anemia, and adverse liver, kidney, central nervous system and reproductive effects. Testicular atrophy, reduced sperm counts, abnormal sperm and sterility have been observed in mice, rats and dogs fed at a daily level of 45 mg/kg of body weight based on boron product equivalents. Oral administration of boric acid to pregnant mice, rats and rabbits has caused increased incidences of fetal death and malformed offspring.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects

Aquatic toxicity : May cause pH changes in aqueous ecological systems. May cause pH changes in aqueous ecological systems.
Toxicity to other organisms : No data available.

Persistence and degradability

Mobility : No data available.

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

Bioaccumulation : No data is available on the product itself.

13. DISPOSAL CONSIDERATIONS

Waste from residues / unused products : In accordance with local and national regulations. Return unused product in original cylinder to supplier. Contact supplier if guidance is required. Must not be discharged to atmosphere.

Contaminated packaging : Return cylinder to supplier.

14. TRANSPORT INFORMATION

CFR

Proper shipping name : Boron trichloride
Class : 2.3 (8)
UN/ID No. : UN1741

IATA

Proper shipping name : Boron trichloride
UN/ID No. : UN1741

IMDG

Proper shipping name : BORON TRICHLORIDE
Class : 2.3 (8)
UN/ID No. : UN1741

CTC

Proper shipping name : BORON TRICHLORIDE
Class : 2.3 (8)
UN/ID No. : UN1741

Further Information

Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard (29 CFR 1910.1200) Hazard Class(es)

Toxic Corrosive. Compressed Gas.

Country	Regulatory list	Notification
USA	TSCA	Included on Inventory.
EU	EINECS	Included on Inventory.
Canada	DSL	Included on Inventory.
Australia	AICS	Included on Inventory.

Material Safety Data Sheet

Version 1.5
Revision Date 09/27/2004

MSDS Number 300000000008
Print Date 03/30/2005

Japan	ENCS	Included on Inventory.
South Korea	ECL	Included on Inventory.
China	SEPA	Included on Inventory.
Philippines	PICCS	Included on Inventory.

EPA SARA Title III Section 312 (40 CFR 370) Hazard Classification:
Acute Health Hazard Sudden Release of Pressure Hazard.

EPA SARA Title III Section 313 (40 CFR 372) Component(s) above 'de minimus' level:
Boron trichloride

US. California Safe Drinking Water & Toxic Enforcement Act (Proposition 65)
This product does not contain any chemicals known to State of California to cause cancer, birth defects or any other harm.

16. OTHER INFORMATION

NFPA Rating

Health : 3
Fire : 0
Instability : 1

HMIS Rating

Health : 3*
Flammability : 0
Physical hazard : 1

Prepared by : Air Products and Chemicals, Inc. Global EH&S Product Safety Department

For additional information, please visit our Product Stewardship web site at
<http://www.airproducts.com/productstewardship/>