

Revision: 005

Date: 11-08-03

1. IDENTIFICATION OF THE SUBSTANCE AND COMPANY UNDERTAKING

General Chemical Name BORON TRIBROMIDE

Intended or recommended uses of substance: Research, doping in electronic industry.

Supplier (Distributor) New Metals & Chemicals Ltd
Newmet House, Rue de St. Lawrence
Waltham Abbey, Essex, EN9 1PF
Telephone: +44(0) 1992 711111

2. COMPOSITION/INFORMATION ON INGREDIENTS

| Ingredient name | Concentration/range | *Classification | Case No | EINECS No |
|------------------|---------------------|---------------------|-------------|-----------|
| Boron tribromide | 100% | T+, C: R14-26/28-35 | 010294-33-4 | 233-657-9 |

*see 16. OTHER INFORMATION for full text of R-phrases

3. HAZARD IDENTIFICATION

Corrosive
Reacts violently with water
Irritating to respiratory system
Causes burns
Extremely toxic by inhalation and if swallowed.

Harmful by ingestion, inhalation and through the skin. Very destructive of mucous membranes. Vapour is very irritating. Contact with eyes or skin causes severe burns.

4. FIRST AID MEASURES

| | |
|--------------|---|
| Inhalation | Move the patient to fresh air and administer 100 percent humidified supplemental oxygen with assisted ventilation as required. If breathing has ceased DO NOT use mouth-to-mouth respiration apply artificial respiration using oxygen and a suitable mechanical device such as a bag and a mask. Seek immediate medical attention. |
| Skin Contact | Flush skin with copious quantities of water. Remove and destroy all contaminated clothing and shoes. Seek immediate medical attention. |
| Eye Contact | DO NOT allow patient to rub or keep eyes closed. Irrigate with copious quantities of water for at least 15 minutes. Flush under eyelids by lifting lid. DO NOT use a static eye bath. Seek immediate medical attention. |
| Ingestion | DO NOT induce vomiting. If patient is conscious and alert, wash out mouth with water. Give 2 cupfuls of milk or water with great care. Give nothing by mouth if patient is unconscious. Seek immediate medical attention. |

Note: Effects of exposure (inhalation, ingestion or skin contact) to substance may be delayed. Ensure that medical personnel are aware of the materials involved, and take precautions to protect themselves.

5. FIRE FIGHTING MEASURES

Precautions against fire and explosion

Non flammable but may evolve very toxic and corrosive fumes on heating. Contact with water can cause violent liberation of heat with explosion and splattering of the material. Hydrolysis occurs with the liberation of hydrobromic acid and boric acid.

Contact with metals may evolve flammable hydrogen gas.

Containers may explode when heated or if contaminated with water.

Suitable extinguishing media

DO NOT USE water directly on fire. Use a dry powder extinguisher, dry sand dry salt or carbon dioxide Do NOT get water inside containers. Cool containers with flooding quantities of water until well after fire is out. For small fires use dry chemical or carbon dioxide. For large fires flood fire with water from a distance. Avoid water effluent from entering drains.

Extinguishing media which must not be used for safety reasons

Water or foam. See above.

Special exposure hazards arising from the substance itself and its combustion products - including any gaseous by-products

Toxic vapours may be evolved during a fire. Inhalation of vapour may cause chemical burns to the respiratory tract, ulceration of nasal mucosa and possibly bronchospasm.

Causes skin burns and severe eye burns.

Irritating hydrogen bromide and boric acid may form in a fire

Hydrogen may be formed in confined spaces.

Special protective equipment for fire-fighters

Wear self-contained breathing apparatus and full chemical protective clothing. Decontamination must follow before removal of gear.

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions

Remove or extinguish ALL ignition sources. Turn off hot air heating system. Evacuate all but essential authorised control personnel. Wear self contained breathing apparatus and acid and vapour resistant chemical suits (PVC) boots and gloves to avoid inhalation, skin and eye contact. Provide sufficient ventilation.

Structural firefighters` protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations.

Environmental Precautions

Prevent entry into drains, surface and ground water, soil and confined areas. Alert neighbours if necessary.

Methods for Cleaning Up

Only trained, authorised personnel should be involved. Fully encapsulating protective clothing and self contained breathing apparatus should be worn for spills and leaks with no fire. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.

Stop leak if you can do it without risk. Use water spray cautiously to reduce vapours. DO NOT put water directly on leak, spill area or inside container.

Keep combustibles (wood, paper, oil etc) away from spilled material. Cover spills with dry sand, dry diatomaceous earth or dry salt followed with plastic sheet to minimise spreading or contact with water. Use clean non-sparking tools to collect material and place it into loosely covered plastic containers. In a fume cupboard or LEV room, cautiously add the adsorbed material gradually to a large excess of water containing ice.. Do not put water onto the adsorbed material - it could explode. Wait until the reaction has subsided then neutralise the mass with sodium carbonate or sodium hydroxide solution. Place residues in a closed plastic container, suitably marked, and dispose of through a licensed waste disposal contractor. Very cautiously wash spill area with water retaining effluent for disposal.

7. HANDLING AND STORAGE

Precautions for safe handling

To be handled by qualified and trained staff only.
Handle in a fume cupboard or dedicated LEV room with scrubbing system.
Avoid all contact with water.
Wash or decontaminate after handling. Wash hands before eating. Discard contaminated shoes.
Do not get in eyes, on skin or on clothing. Do not ingest or inhale.
Keep container tightly closed.
See section 8 for personal protective equipment.

Precautions for safe storage

Store in a tightly closed glass containers with special high density polypropylene caps with teflon liners.. Store in a cool, dry, well ventilated area away from incompatible substances (see section 10). Keep away from water.
Do not store in metal or plastic containers.

Specific use

Chemical synthesis, as a doping agent in electronic crystal growing.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Exposure limit values

| Ingredient name | OES LTEL (8hr TWA) | OES STEL (15min) | MEL (LT) | MEL (ST) |
|------------------|-----------------------|---------------------|----------|----------|
| Boron tribromide | | 1.0ppm | - | - |

Occupational exposure controls

| | |
|------------------------|--|
| Eye protection | Wear appropriate protective eyeglasses, chemical safety goggles or full face shield to European Standard EN 166. |
| Hand protection | Wear appropriate gloves. Suitable material is butyl rubber. However, due regard must be taken that heavy gloves will interfere with the wearer's sense of touch and may contribute to a dangerous situation. Thinner gloves of nitrile or PVC may be used as single splash disposable gloves and must be discarded immediately after use. Gloves should comply with European Standard EN 374-3 class 3. |
| Skin protection | Use one or more of the following personal protection equipment as necessary. Full chemical protective suit to EN 465 standard, PVC apron, helmet and boots. |
| Respiratory protection | If product is not used in a fume cupboard wear full face or hood compressed airline breathing apparatus to EN 139 or EN 270/271 alternatively use self contained breathing apparatus to EN 137. This equipment should always be available on standby. |
| Ingestion | Do not eat, drink or smoke when using this product. Do not ingest. Exhibit the strictest hygiene control. |

Environmental exposure controls

No specific environmental legislation applies, however in accordance with best practice only use in a fume cupboard or with local exhaust ventilation, ventilated to a scrubbing system. In case of fire, spillage or leakage, prevent material from entering water courses, sewers or soil.

9. PHYSICAL AND CHEMICAL PROPERTIES

General information

| | |
|------------|---|
| Appearance | Colourless to pale yellow fuming liquid |
| Odour | Pungent, acrid, penetrating odour |

Important health, safety and environmental information

| | |
|---------------------------------|----------------------------|
| pH | N/A |
| Boiling point/boiling range | 91°C |
| Melting point/melting range | -45°C |
| Flash point | N/A |
| Flammability (solid, gas) | Non flammable |
| Autoignition temperature | N/A |
| Explosive properties | N/A |
| Oxidising properties | N/A |
| Vapour pressure | 40mm _{Hg} at 25°C |
| Relative density | 2.643 at 15°C |
| Solubility -water solubility | Reacts violently |
| Viscosity | N/A |
| Vapour density | N/A |
| Evaporation rate | N/A |

10. STABILITY AND REACTIVITY

| | |
|----------------------------------|--|
| Conditions to avoid | Stable under normal temperatures and pressures. Slowly decomposes when subjected to light with the evolution of bromine causing liquid to become yellow and then red. |
| Materials to avoid | Reacts extremely violently with water, sodium and potassium. Incompatible with metals, strong bases, acids, alcohols, strong oxidizing agents, combustible materials, ammonia, metal hydrides and mercury. |
| Hazardous decomposition products | When heated to decomposition emits highly toxic fumes of hydrogen bromide and boron oxides. In contact with water emits heat, hydrobromic acid and boric acid. |

If released into the environment, rapid hydrolysis will take place liberating boric acid and hydrobromic acid. The later is hazardous to all flora and fauna. It will slowly decompose into bromine which is even more toxic.

11. TOXICOLOGICAL INFORMATION

Extremely toxic and corrosive due to rapid hydrolysis of the material with water into hydrobromic acid and boric acid. The clinical effects given relate principally to these secondary products. Much heat develops when hydrolysis occurs giving rise to further effects such as thermal burns. Material is extremely destructive of the mucous membranes and upper respiratory tract. Vapour is very irritating.

| | |
|---------------------------|--|
| Effects from eye contact | Causes severe irritation and damage to the eyes. Symptoms include irritation and redness. Splash contact may cause severe burns with corneal erosions and blindness. Permanent scars may appear in the cornea after a few weeks. |
| Effects from skin contact | Severe burns may occur. Complications may include cellulitis, sepsis, contractures, osteomyelitis and systemic toxicity. Permanent scars may appear in the skin. Chemical burns to the skin are often associated with concurrent thermal burns and trauma. |
| Effects from inhalation | Very toxic by inhalation. Causes severe irritation and destruction of the membranes of the nose, throat and |

lungs. Inhalation may produce dyspnea, pleuritic chest pain, upper respiratory edema, pulmonary edema, hypoxemia, bronchospasm, pneumonitis and persistent pulmonary function abnormalities.

Effects from ingestion Results in corrosion of mucous membranes of mouth, throat and oesophagus with immediate pain and dysphagia. Necrotic areas develop rapidly. Epigastric hemorrhage may be intense and vomitus contains fresh blood. Ulceration of all contact membranes occurs. Corrosion may lead within a few hours or a few days to gastric perforation and peritonitis. Major surgical repair should be anticipated. Circulatory shock is often immediate cause of death. May lead to renal failure and ischemic lesions in liver and heart.

- | | | |
|-----|---|--------------------|
| (a) | Acute toxicity (oral, inhalation, dermal) | not tested/no data |
| (b) | Corrosivity/irritation (eye, skin, respiratory tract) | not tested/no data |
| (c) | Sensitisation (skin, respiratory) | not tested/no data |
| (d) | Repeated-dose toxicity | not tested/no data |
| (e) | Mutagenicity | not tested/no data |
| (f) | Carcinogenicity | not tested/no data |
| (g) | Reproductive toxicity (fertility, developmental) | not tested/no data |

12. ECOLOGICAL INFORMATION

(1) Ecotoxicity

(a) Aquatic toxicity

- | | | |
|-------|------------------------------|--------------------|
| (i) | acute and chronic for fish | not tested/no data |
| (ii) | “ “ “ “ daphnia | not tested/no data |
| (iii) | “ “ “ “ algae | not tested/no data |
| (iv) | “ “ “ “ other aquatic plants | not tested/no data |

(b) Soil toxicity

- | | | |
|-----|-----------------|--------------------|
| (i) | macro organisms | not tested/no data |
|-----|-----------------|--------------------|

| | |
|----------------------|--------------------|
| (ii) micro organisms | not tested/no data |
| (iii) birds | not tested/no data |
| (iv) bees | not tested/no data |
| (v) plants | not tested/no data |
| (vi) fauna | not tested/no data |

Although specific data is not available, it is established by experience that the product is extremely toxic and corrosive to all forms of life. Consequently, great care must be taken to avoid its entrance into water courses or soil

(2) Mobility

The product is rapidly hydrolysed to hydrobromic acid and boric acid. Hydrobromic acid may persist in water courses or soil for some time and retain its toxic effects.

(3) Persistence and degradability

Hydrobromic acid may persist in water or soil for some time only gradually degrading by elimination of bromine, which itself is highly toxic.

Hydrobromic acid must be prevented from entering sewage systems as it is a virulent toxin for the sewage treatment bacteria.

(4) Bioaccumulation potential

It is doubtful if the material or its hydrolysis products could enter the food chain as destruction of the source would initially take place.

(5) Other adverse effects

No other effects are known.

13. DISPOSAL CONSIDERATIONS

All waste material to be contained in a plastic sealed bin, duly marked, and disposed of as special waste through a licensed waste contractor in accordance with "The Special Waste Regulations 1996". See sections 6 and 7.

14. TRANSPORT INFORMATION

| | Airfreight (IATA) | Seafreight (IMDG) | Road (ADR) | Rail (RID) |
|-----|----------------------------------|-------------------|---------------------------------------|------------|
| (a) | UN number | | 2692 | |
| (b) | class | | 8 | |
| (c) | proper shipping name | | Boron tribromide | |
| (d) | packing group | | I | |
| (e) | marine pollutant (if applicable) | | N/A | |
| (f) | other applicable information | | forbidden for transport by air | |

15. REGULATORY INFORMATION

EC Supply - Chip-3 regulations 2002, regulation 9

T+, C Extremely Toxic and Corrosive

Risk Phrases:

- 14: Reacts violently with water.
- 26/28: Very toxic by inhalation and if swallowed.
- 35: Causes severe burns

Safety Phrases:

- 9: Keep container in a well ventilated place.
- 26: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
- 28: After contact with skin, wash immediately with plenty of water.
- 36/37/39: Wear suitable protective clothing, gloves and eye/face protection.
- 45: In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)

EC Label No. 232-657-9

This material is subject to the COSHH regulations 2002. See COSHH Essentials for further information.

16. OTHER INFORMATION

R Phrases Full Text:

- R14: Reacts violently with water

R26/28: Very toxic by inhalation and if swallowed

R35: Causes severe burns.

This material should only be handled by qualified, trained chemists, fully familiar with its dangerous properties. During use or handling, a minimum of two persons should always be available.

Chemicals (Hazard Information and Packaging for Supply) Regulations 2002

Approved classification and labelling guide. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002 Guidance on Regulations L131

Approved Supply List. Information Approved for the Classification and labelling of Substances and Preparations Dangerous for Supply. Chemicals (Hazard Information and Packaging for Supply) Regulations 2002. Approved List L129

Control of Substances Hazardous to Health Regulations 2002

Health and Safety at Work Act 1974

COSHH Essentials: Easy Steps to Control Chemicals. Control of Substances Hazardous to Health Regulations

Occupational Exposure Limits 2001/2002 EH40

European Inventory of Existing Commercial Substances (EINECS) available on the European Chemicals Bureau website at www.ecb.jrc.it/existing-chemicals

First Aid at Work. The Health and Safety (First Aid) Regulations 1981. Approved Code of Practice and Guidance L74

Personal Protective Equipment (EC Directive) Regulations 1992

The Selection, Use and Maintenance of Respiratory Protective Equipment: A Practical Guide HSG53

Cost and Effectiveness of Chemical Protective Gloves for the Workplace. Guidance for Employers and Health and Safety Specialists. HSG206

Environmental Protection Act 1990 c43

Environmental Act 1995 c25

The Special Waste Regulations 1996

The Dangerous Substances and Explosive Atmospheres Regulations 2002

