



Ammonium Pentaborate

Section 1 Identification of the chemical and of the supplier

1.1	Product Identifier	Ammonium Pentaborate	
1.2	Other means of identification	Ammonium pentaborate tetrahydrate	
1.3	Recommended use of the chemical and restrictions on use	Industrial manufacturing Flame retardant	
1.4	Supplier's details (including name, address, phone number, email)	Rio Tinto Minerals Asia Pte Ltd 12 Marina Boulevard #20-01 Marina Bay Financial Centre Tower 3 Singapore 018982 +65 6679 9316 rtb.sds@riotinto.com	Borax Europe Limited 6 St. James's Square London, SW1Y 4AD, United Kingdom +44 20 7781 2000
	Manufacturer	Borax Français S.A.S. Usine/Siège Social Route de Bourbourg CS 70059 59411 Coudekerque-Branche Cedex, France + (33) 3 28 29 28 30	
1.5	Emergency phone number	APAC +65 3158 1074 (24-Hr Non toll-free number) (Rio Tinto Borates) EIMEA +44 (0) 1235 239 670 (Rio Tinto Borates)	

Section 2 Hazards identification

- 2.1 **Classification of the substance or mixture**
- Reproductive Toxicity Category 2
Acute Toxicity (Oral) Category 5
- 2.2 **GHS label elements, including pictogram or symbol, signal word, hazard and precautionary statements**

Hazard pictograms



Signal word: Warning

Hazard statements:

H361d: Suspected of damaging the unborn child.
H303: May be harmful if swallowed.

Precautionary statements:

P202: Do not handle until all safety precautions have been read and understood.

P308+P313: IF exposed or concerned: Get medical advice.
 P501: Dispose of contents/container in accordance with local regulation.

Other hazards which do not result in classification (e.g. dust explosion hazard): None

Section 3 Composition/information on ingredients

3.1 Substances

Chemical name	Common names and synonyms	CAS No.	% content
Ammonium pentaborate tetrahydrate	Ammonium pentaborate	12046-04-7	>99.0

Section 4 First aid measures

4.1 Description of first aid measures

Protection of first-aiders: No special protective clothing is required.

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

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

Skin contact: No treatment necessary.

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.

4.2 Most important symptoms and effects both acute and delayed: Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling (see Section 11).

4.3 Indication of any immediate medical attention and special treatment needed: Note to physicians: Supportive care only is required for adult ingestion of less than a few grams of the product. For ingestion of larger amounts, maintain fluid and electrolyte balance and maintain adequate kidney function. Gastric lavage is only recommended for heavily exposed, symptomatic patients in whom emesis has not emptied the stomach. Hemodialysis should be reserved for patients with massive acute absorption, especially for patients with compromised renal function. Boron analyses of urine or blood are only useful for verifying exposure and are not useful for evaluating severity of poisoning or as a guide in treatment¹.

Section 5 Fire-fighting measures

5.1 Suitable (and unsuitable) extinguishing media

Suitable extinguishing media: Use extinguishing media that are appropriate to local circumstances and the surrounding environment.

Unsuitable extinguishing media: None

5.2 Special hazards arising from the chemical

The product is not flammable, combustible or explosive. Ammonia gas may be released at high temperatures.

5.3 Special protective equipment and precautions for fire-fighters:

The product is itself a flame retardant. Ammonia gas may be released at high temperatures.

Section 6 Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

For non-emergency personnel:

Eye goggles are not required for normal industrial exposures, but eye protection according to ANSI Z.87.1 or other national standards should be considered. Respirators should be considered if environment is excessively dusty.

For emergency responders:

Eye goggles are not required for normal industrial exposures, but eye protection according to ANSI Z.87.1 or other

national standards should be considered. Respirators should be considered if environment is excessively dusty.

6.2 Environmental precautions: The product is a water-soluble white powder that may cause damage to trees or vegetation by root absorption. Avoid contamination of water bodies during clean up and disposal. 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 or meets local water quality standards.

6.3 Methods and material for containment and cleaning up

Appropriate containment: Avoid spillage into water and cover drains.

Land spill: Vacuum, shovel or sweep up and place in containers for disposal in accordance with applicable local regulations.

Spillage into water: Where possible, remove any intact containers from the water.

6.4 Reference to other sections

Refer to sections 8, 12 and 13.

Section 7 Handling and storage

7.1 Precautions for safe handling

Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills. Do not eat, drink and smoke in work areas. Wash hands after use. Remove contaminated clothing and protective equipment before entering eating areas.

7.2 Conditions for safe storage, including any incompatibilities

No special handling precautions are required, but dry, indoor storage is recommended. To maintain package integrity and to minimise caking of the product, bags should be handled on a first-in first-out basis.

Storage temperature: Ambient
Storage pressure: Atmospheric
Special sensitivity: Moisture (Caking)

Section 8 Exposure controls/personal protection

8.1 Control parameters

Occupational exposure limit values: In the absence of a national OEL, Rio Tinto Borates recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m³. To convert product into equivalent boron (B) content, multiply by 0.1986.

8.2 Appropriate engineering controls: Use local exhaust ventilation to keep airborne concentrations of dust below permissible exposure limits.

8.3 Personal protection equipment:

Eye and face protection: Eye protection according to ANSI Z.87.1 or other national standards are required.
 Skin protection: Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty.
 Respiratory protection: Where airborne concentrations are expected to exceed exposure limits, respirators should be used (EN149).

Section 9 Physical and chemical properties

9.1 Information on basic physical and chemical properties

Appearance:	White, crystalline solid
Odour	Ammoniacal
Odour threshold:	Not measured
pH @ 20°C:	8.35 (1.0% solution); 7.32 (10.0% solution)
Melting point/ Freezing point:	>500°C
Initial boiling point and boiling range:	Not applicable: melting point >300°C
Flash point:	Not applicable: inorganic substance
Evaporation rate:	Not applicable: non-volatile
Flammability (solid/ gas):	Non-flammable
Upper/lower flammability or explosive limits:	Not applicable: non-flammable
Vapour pressure:	Not applicable: melting point >300°C
Vapour density:	Not applicable: melting point >300°C
Relative density:	1.574
Solubility(ies):	Water: 9.62% @ 20°C; 41.2% @ 90°C

Partition coefficient; n-octanol/water:	Not applicable: inorganic substance
Auto-ignition temperature:	Not applicable: not self-heating
Decomposition temperature:	Not applicable: melting point >300°C
Viscosity:	Not applicable: solid substance
Explosive properties:	Not explosive: does not contain chemical groups associated with explosive properties
Oxidising properties:	Not oxidising: does not contain chemical groups associated with oxidising properties

9.2 Other information	
Molecular weight:	272
Formula:	NH ₄ B ₅ O ₈ ·4H ₂ O

Section 10 Stability and reactivity

- 10.1 Reactivity:** None known.
- 10.2 Chemical stability:** Slowly breaks down to release ammonia.
- 10.3 Possibility of hazardous reactions:** Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard. Reaction with strong bases such as NaOH will generate ammonia (NH₃).
- 10.4 Conditions to avoid:** Avoid contact with strong reducing agents or strong bases according to good industrial practice.
- 10.5 Incompatible materials:** Strong reducing agents and strong bases.
- 10.6 Hazardous decomposition products:** Ammonia.

Section 11 Toxicological information

- 11.1 Information on the likely routes of exposure (inhalation, ingestion, skin and eye contact)**
Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because product is poorly absorbed through intact skin. Product is *not* intended for ingestion.

(a) Acute toxicity

Method: Acute Oral Toxicity Study

Species: Swiss mice

Dose: Doses used in study were not described in the report.

Routes of Exposure: Oral

Results: Low acute oral toxicity. LD₅₀ in mice is greater than 4,200 mg/kg of body weight. Based on the available data, the classification criteria are not met.

(b) Skin corrosion / irritation: Based on similar substance Ammonium Baborate

Method: Acute Oral Toxicity Study

Species: Rabbit

Dose: 0.5 grams applied to intact and abraded skin

Routes of Exposure: dermal

Results: Based on the lack of dermal irritation responses in the rabbit from dermal application of ammonium baborate, no dermal irritation would be expected from ammonium pentaborate.

(c) Serious eye damage / irritation:

Method: Primary Eye Irritation Study

Species: Rabbit

Dose: 0.1 grams

Routes of Exposure: placed in the left conjunctiva of three adult albino rabbits

Results: Slight initial reaction was observed subsiding after 30 minutes, Based on the results of the primary eye irritation study, the classification criteria are not met.

(d) Respiratory or skin sensitization: Not a skin sensitiser (based on boric acid).

(e) Germ cell mutagenicity: No data on the product itself. Not mutagenic based on boric acid.

(f) Carcinogenicity: No data on the product itself. Not carcinogenic based on boric acid.

(g) Reproductive toxicity:

No data on the product itself. However, animal feeding studies with boric acid and sodium tetraborate in rat, mouse and dog, at high doses, have demonstrated effects on fertility and testes². Studies with the chemically related boric acid in rat, mouse and rabbit, at high doses, demonstrate developmental effects on the foetus including foetal weight loss and minor skeletal variations. The lowest NOAEL is 9.6 mg B/kg in rats, based on developmental effects. The doses administered

were many times in excess of those which humans would normally be exposed to^{3,4}. While boron has been shown to adversely affect male reproduction in laboratory animals, there was no clear evidence of male reproductive effects attributable to boron in studies of highly exposed workers⁵. Based on weight of evidence evaluation, classification of ammonium pentaborate as Repr. Cat. 2 is justified.

(h) STOT-single exposure: No data on the product itself.

(i) STOT-repeated exposure: No data on the product itself.

(j) Aspiration hazard: Physical form of solid powder indicates no aspiration hazard potential.

Toxicokinetics

In the blood boric acid is the main species present and is not further metabolised. Boric acid is distributed rapidly and evenly through the body, with concentrations in bone 2 - 3 higher than in other tissues. Boric acid is excreted rapidly, with elimination half-lives of 1 h in the mouse, 3 h in the rat and < 27.8 h in humans, and has low potential for accumulation. Boric acid is mainly excreted in the urine. Absorption of borates via the oral route is nearly 100 %. For the inhalation route also 100 % absorption is assumed as worst case scenario. Dermal absorption through intact skin is very low with a percent dose absorbed < 0.5%.

11.2 Symptoms related to the physical, and chemical and toxicological characteristics:

At high concentrations irritation of nose, throat and eye may be observed. Products are *not* intended for ingestion. Small amounts (e.g. a teaspoonful) swallowed accidentally are not likely to cause effects. Symptoms of accidental over-exposure to high doses of inorganic borate salts have been associated with ingestion or absorption through large areas of severely damaged skin. These may include nausea, vomiting, and diarrhoea, with delayed effects of skin redness and peeling.

11.3 Delayed and immediate effects as well as chronic effects from short and long-term exposure:

Human epidemiological studies show no increase in pulmonary disease in occupational populations with chronic exposures to boric acid and sodium borate dust. Human epidemiological studies indicate no effect on fertility in occupational populations with chronic exposures to borate dust and indicate no effect to a general population with high exposures to borates in the environment.

11.4 Numerical measures of toxicity (such as acute toxicity)

None. This product is a substance.

Section 12 Ecological information

12.1 Ecotoxicity (aquatic and terrestrial, where available)

General: Boron occurs naturally in sea water at a nearly uniform average concentration of 5 mg B/l and fresh water between 0.01 and 0.4 mg B/l. In diluted aqueous solutions the predominant boron species present is undissociated boric acid. To convert product into equivalent boron (B) content, multiply by 0.1986.

Algal toxicity⁶:

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

Invertebrate toxicity:

Daphnids, *Daphnia magna* Straus⁷
48-hr LC₅₀ = 133mg B/l†
21-day NOEC-LOEC = 6-13mg B/l†

Fish toxicity:

Sea water⁸:
Dab, *Limanda limanda*
96-hr LC₅₀ = 74 mg B/l†

Fresh water⁷:

Rainbow trout, *Oncorhynchus mykiss* (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†

Test substance: † Boric acid
‡ Sodium tetraborate

Phytotoxicity: Boron is an essential micronutrient for healthy growth of plants. It can be harmful to boron sensitive plants in higher quantities. Care should be taken to minimise the amount of borate product released to the environment.

12.2 Persistence and Degradability

Biodegradation is not an applicable endpoint since the product is an inorganic substance.

- 12.3 Bioaccumulative potential**
This product will undergo hydrolysis in water to form undissociated boric acid. Boric acid will not biomagnify through the food chain. Octanol/Water partition coefficient: $\text{Log } P_{ow} = -0.7570 @ 25^{\circ}\text{C}$ (based on boric acid).
- 12.4 Mobility in soil**
The product is soluble in water and is leachable through normal soil. Adsorption to soils or sediments is insignificant.
- 12.5 Other adverse effects**
None

Section 13 Disposal considerations

- 13.1 Disposal methods**
Product packaging should be recycled where possible.
Local authorities should be consulted about any specific local requirements
- Such product should, if possible, be used for an appropriate application.

Section 14 Transport information

Transport Classification for Road (ADR) / Rail (RID); Inland waterways (ADN); Sea (IMDG); Air (ICAO/IATA)

14.1 UN Number:	Not Regulated
14.2 UN Proper Shipping Name:	Not Regulated
14.3 Transport hazard class(es):	Not Regulated
14.4 Packing Group:	Not Regulated
14.5 Environmental Hazards (e.g. marine pollutant)	Not Regulated
14.6 Special precautions for user:	Not Regulated
14.7 Transport in bulk according to Annex II of MARPOL 73/78 and the IBC code:	Not Regulated

Section 15 Regulatory information

- 15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture**

International regulations

Chemical Weapon Convention List Schedule I, II & III Chemicals: Not listed.

Clean Air Act (Montreal Protocol) - Substances that deplete the ozone layer: Not manufactured with and does not contain any Class I or Class II ozone depleting substances.

Stockholm Convention on Persistent Organic Pollutants: Not listed

Rotterdam Convention on Prior Informed Consent (PIC): Not listed

UNECE Aarhus Protocol on POPs and Heavy Metals: Not listed

Regulation (EC) No 689/2008 - Export and Import of Dangerous Chemicals: Not listed.

National Regulations: Ensure all national/local regulations are observed.

Chemical inventory listing: The listing is sometimes under the Inventory number of the anhydrous form of this inorganic salt.

United States (TSCA) Active:	12007-89-5
Canada (DSL):	12007-89-5
European Union (EINECS):	234-521-1
Australia (AICS):	12007-89-5
China (IECSC):	12007-89-5
Japan (METI & ISHL):	(1)-60
New Zealand (NZIoC):	12046-04-7
Philippines (PICCS):	Not listed
South Korea (KECI):	KE-09785
Taiwan (NECI):	Listed
Thailand:	Not determined
Vietnam:	12007-89-5

Section 16 Other information

16.1 Date of previous issue: March 2016

16.2 Date of latest revision: January 2020

Revision Details:

Section 2, 11: modified for new Repr. 2 classification.

Section 6, 12: Update information.

Section 15, 16: Additional information.

16.3 References:

1. 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. (1986), 4, 427-458
2. National Toxicology Program (NTP) – Technical Report Series No. TR324, NIH Publication No. 88-2580 (1987), PB88 213475/XAB
3. Fail *et al.*, Fund. Appl. Toxicol. (1991) 17, 225-239
4. Heindel *et al.*, Fund. Appl. Toxicol. (1992) 18, 266-277
5. Scialli *et al.* Reproductive Toxicology (2010) 29: 10 – 24
6. Schöberl P, Marl and Huber L (1988) Tenside Surfactants Detergents 25, 99-107
7. Birge W J, Black J A, EPA-560/-76-008 (April 1977) PB 267 085
8. Taylor *et al.* (1985). Aquatic Toxicology, 7 (1985) 135-144

For general information on the toxicology of borates see Patty's Toxicology, 6th Edition Vol. I, (2012) Chap. 23, 'Boron'.

16.4 Abbreviations and acronyms:

EC: Effect concentration

GHS: Global Harmonised System for classification and labelling of chemicals

IATA: International Air Transport Association

IBC: Intermediate Bulk Container

IMDG: International Maritime Dangerous Goods

LC: Lethal Concentration

LD: Lethal Dose

MARPOL: International Convention for the Prevention of Pollutant From Ships, 1973

STOT: Specific Target Organ Toxicity

LOEC: Lowest Observed Effect Concentration

NA: Not applicable.

NOAEL: No observed adverse effect level

NOEC: No Observed Effect Concentration

STP: Sewage Treatment Plant

Precautionary Phrases:

Do not ingest.

Keep out of reach of children.

Refer to safety data sheet.

Not for use in food, drugs or pesticides.

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