



Ammonium Pentaborate

Section 1 Identification of the substance/mixture and of the Company/undertaking

- 1.1 Product Identifier**
- Chemical name:** Ammonium pentaborate tetrahydrate
CAS No: 12046-04-7
REACH Registration Number: 01-2119970312-43-0001
- EC No:** 234-521-1
Product Name: Ammonium pentaborate
Grades: Technical, SQ
- 1.2 Relevant identified uses of the substance or mixture and uses advised against**
- Identified Uses:** Industrial manufacturing
Flame retardant
- Uses advised against:** None
- 1.3 Details of the supplier of the SDS**
- Company Name:** **Borax Europe Limited**
Address: 6 St. James's Square
London, SW1Y 4AD
United Kingdom
- Telephone number:** +44 (0)20 7781 2000
- Email:** rtm.msds@riotinto.com
- 1.4 Emergency telephone number:** +44 (0) 1235 239 670
Official advisory body telephone number: None

Section 2 Hazards identification

- 2.1 Classification of the substance or mixture**
- Classification (CLP Regulation (EC) No 1272/2008):** Classified as toxic for reproduction (Repr. 2; H361d). Ammonium pentaborate tetrahydrate has a specific concentration limit of $\geq 4.8\%$ for toxic to reproduction classification.
- Classification (Directive 67/548/EEC):** Not classified.
- 2.2 Label Elements**
- Labelling according to Regulation (EC) No 1272/2008 (CLP)

Hazard Pictograms:



Signal word: Warning

Hazard statements:

H361d: Suspected of damaging the unborn child.

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.

Supplemental information:

P312: Call a POISON CENTER or doctor/physician if you feel unwell.

2.3 Other Hazards

H303: May be harmful if swallowed.

Section 3 Composition/information on ingredients

3.1 Substances

Chemical Name	CAS#	EC#	% content
Ammonium pentaborate tetrahydrate	12046-04-7	234-521-1	>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 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 substance or mixture

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

5.3 Advice 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 CEN166:1996, respirators according to CEN149:2001 should be considered.

For emergency responders:

Eye goggles are not required for normal industrial exposures, but eye protection according to CEN166:1996, respirators according to CEN149:2001 should be considered.

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)

7.3 Specific end use(s)

None

Section 8 **Exposure controls/personal protection**

8.1 Control parameters

Occupational exposure limit values: In the absence of a national OEL, Rio Tinto Borax 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.

There is no OEL for ammonium pentaborate tetrahydrate (CAS 12046-04-7).

DNELs

Route of exposure	Workers				Consumers			
	Acute effects local	Acute effects systemic	Chronic effects local	Chronic effects systemic	Acute effects local	Acute effects systemic	Chronic effects local	Chronic effects systemic
Oral	Not Required				*	0.63 mg/kg/day	*	0.63 mg/kg/day
Inhalation	17.04 mg/m ³	5.4 mg/m ³	7.1 mg/m ³	5.4 mg/m ³	17.04 mg/m ³	2.69 mg/m ³	9.3 mg/m ³	2.69 mg/m ³
Dermal	*	*	*	252 mg/kg/day	*	*	*	127 mg/kg/day

* No hazard identified

Monitoring procedure: *BS EN 14042:2003 Title identifier: Workplace atmospheres. Guide for the application and use of procedures for the assessment of exposure to chemical and biological agents.*

PNECs

Compartment (Environment)	PNEC (added values)
Water, fresh and marine	2.02 mg B/L
Water, intermittent	13.7 mg B/L
Air	No exposure expected
Soil	5.4 mg B/kg dry soil
Sediment	Waived due to lack of partitioning to sediment
STP	10 mg B/L

8.2 Exposure controls

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

Personal protection equipment:

Eye and face protection: Eye protection according to GEN166:1996 may be warranted if environment is excessively dusty.
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 (CEN149:2001).

Environmental exposure controls:

Limiting releases from site: Where appropriate, material should be recovered and recycled through the process. Spillages of powder or granulated borates should be swept or vacuumed up immediately and placed in containers for disposal in order to prevent unintentional release to the environment. Waste containing borates should be handled as a hazardous waste and removed by licensed operator to an offsite location where it can be incinerated or disposed to a hazardous landfill.

Water Emissions: Storage should be sheltered from precipitation. Avoid spillage into water and cover drains. Removal from water can only be accomplished by very specific treatment technologies including ion exchange resins, reverse osmosis etc. Removal efficiency is dependent upon a number of factors and will vary from 40 to 90%. Much of the technology is currently not appropriate to high volume or mixed waste streams. Boron is not removed in considerable amounts in conventional STP. If sites discharge to a municipal STP the concentration of boron should not exceed 10 mg B/l in the municipal STP.

Air Emissions: Emissions to air can be removed by one or more of the following dust-control measures: electrostatic precipitators, cyclones, fabric or bag filters, membrane filters, ceramic and metal mesh filters, and wet scrubbers.

Section 9 **Physical and chemical properties**

9.1 Information on basic physical and chemical properties

Appearance:	White, crystalline solid
Odour	Ammonia-like
Odour threshold:	Not measured
pH @ 20°C:	8.35 (1.0% solution); 7.32 (10.0% solution)
Melting point/ Freezing point:	>300°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/liquid):	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:	1574 kg/m ³
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 toxicological effects

(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 sensitisation: 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^{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 of < 0.5 %.

Information on likely routes of exposure:

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.

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.

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.

Section 12 Ecological information

12.1 Toxicity

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: Log P_{ow} = -0.7570 @ 25 °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 Results of PBT and vPvB assessment

Not applicable (see Section 15.2).

12.6 Other adverse effects

None

Section 13 Disposal considerations

13.1 Waste treatment methods

Small quantities can be disposed of at landfill sites. Tonnage quantities are not recommended to be sent to landfill. Such product should, if possible, be used for an appropriate application.

Product packaging should be recycled where possible.

Local authorities should be consulted about any specific local requirements.

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	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

Regulation (EC) No 2037/2000 - Substances that deplete the ozone layer: Not manufactured with and does not contain

any Group I or Group II ozone depleting substances.

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.

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.

U.S. EPA TSCA Inventory: 12007-89-5
Canada DSL: 12007-89-5
EINECS: 234-521-1

15.2 Chemical safety assessment

No Chemical Safety Assessment has been carried out for this substance.

Section 16 Other information

Revision Details:

Section 1: Addition of registration number. Supplier address. Emergency telephone numbers.

Section 8: Addition of DNELs and PNECs.

Annex – Summary of Exposure Scenarios.

Abbreviations and acronyms:

CLP: Classification, Labelling and Packaging Regulation (EC) No. 1272/2008

CMR: Carcinogen, Mutagen, Reproductive Toxicant

LC: Lethal Concentration

LD: Lethal Dose

NOAEL: No Observed Adverse Effect Level

NOEC: No Observed Effect Concentration

STOT: Specific Target Organ Toxicity

DNEL: Derived No Effect Level

PNEC: Predicted No Effect Concentration

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent, very Bioaccumulative

STP: Sewage Treatment Plant

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'

Full text of Hazard statements mentioned in section 2:

H361d: Suspected of damaging the unborn child.

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.

Precautionary Phrases:

Call a POISON CENTER or doctor/physician if you feel unwell.

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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Annex

Exposure Scenarios

The following table lists the uses identified and registered for this substance. Each use has a number of applicable human health, environmental and consumer exposure scenarios. These can be found at www.borax.com/EU-REACH/exposure-scenarios

IU number	Identified Use	Setting (industrial/profession al worker / consumer)	Life cycle stage					Sector of use category (SU)	Process category (PROC)	Environment al release category (ERC)	Exposure Scenario Title
			Manufacture	Formulation	End use	Consumer	Service life (for articles)				
1	Manufacture of ammonium borate	Industrial	X					8	1, 9	1	ES1 Manufacture; Manufacture of substance
2	Industrial use in electrolytic capacitors	Industrial			X			9, 10, 16	2, 3, 5, 9	4	ES2 Use at industrial site; Industrial use in electrolytic capacitors