Section 1. Identification

Product name : ***Solubor***®

Chemical name : Disodium octaborate tetrahydrate

Product type : Solid.

Relevant identified uses of the substance or mixture and uses advised against

Material uses : Micronutrient fertiliser

Supplier's details : U.S. Borax Inc.
14486 Borax Road
Boron, CA 93516-2000
USA
+1 (760) 762 7000

e-mail address of person responsible for this SDS : rtb.sds@riotinto.com

Emergency telephone number : +55 11 3197 5891 (Rio Tinto Borates)
For advice on chemical emergencies, spillages, fires or first aid.

Section 2. Hazards identification

Classification of the substance or mixture : ACUTE TOXICITY (oral) - Category 5
TOXIC TO REPRODUCTION - Category 2

GHS label elements

Hazard pictograms :



Signal word : Warning

Hazard statements : May be harmful if swallowed.
Suspected of damaging fertility or the unborn child.

Precautionary statements

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

Response : IF exposed or concerned: Get medical advice/attention.

Storage : Not applicable.

Disposal : Dispose of contents/container in accordance with local regulation.

Other hazards which do not result in classification : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : Disodium octaborate tetrahydrate

Ingredient name	%	Identifiers	Classification
Disodium octaborate tetrahydrate	>98	CAS: 12280-03-4 EC: 234-541-0	ACUTE TOXICITY (oral) - Category 5 TOXIC TO REPRODUCTION - Category 2

There are no ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

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

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

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.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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.

Ingestion : This product is not intended for ingestion. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms. 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.

Over-exposure signs/symptoms

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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.

Ingestion : 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.

Indication of immediate medical attention and special treatment needed, if necessary

Section 4. First aid measures

Notes to physician : 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 treatment.

Specific treatments : No specific treatment.

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

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire.

Unsuitable extinguishing media : None known.

Specific hazards arising from the chemical : None. The product is not flammable, combustible or explosive.

Hazardous thermal decomposition products : None.

Special protective actions for fire-fighters : None.

Special protective equipment for fire-fighters : Not applicable.

Remark : Not explosive.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialized clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

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.

Methods and materials for containment and cleaning up

Small spill : Move containers from spill area. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor.

Section 6. Accidental release measures

Large spill : Move containers from spill area. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Avoid dust generation. Do not dry sweep. Vacuum dust with equipment fitted with a HEPA filter and place in a closed, labeled waste container. Dispose of via a licensed waste disposal contractor. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Good housekeeping procedures should be followed to minimise dust generation and accumulation. Avoid spills.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

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

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
Disodium octaborate tetrahydrate	**Ministry of Labor and Employment (Brazil)** Ordinance No. 3214, 6/8/78, NR-15, Annex 11, as amended through 3/10/1994 & NR-09, as amended through 12/29/1994 8 hours: 2 mg/m³. Ordinance No. 3214, 6/8/78, NR-15, Annex 11, as amended through 3/10/1994 & NR-09, as amended through 12/29/1994 15 minutes: 6 mg/m³.

Biological exposure indices

No exposure indices known.

Recommended monitoring procedures : In the absence of a national OEL, Rio Tinto Borates recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/m^3. To convert product into equivalent boron (B) content, multiply by 0.21.

Appropriate engineering controls : If user operations generate dust, fumes, gas, vapor or mist, use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Section 8. Exposure controls/personal protection

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: safety glasses with side-shields.

Skin protection

Hand protection : Standard work gloves (cotton, canvas or leather) may be warranted if environment is excessively dusty.

Body protection : No special protective clothing is required.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Based on the hazard and potential for exposure, select a respirator that meets the appropriate standard or certification. Respirators must be used according to a respiratory protection program to ensure proper fitting, training, and other important aspects of use.

Section 9. Physical and chemical properties

The conditions of measurement of all properties are at standard temperature and pressure unless otherwise indicated.

Appearance

Physical state : Solid.

Color : White.

Odor : Odorless.

Odor threshold : Not applicable. Odorless.

pH : 8.2 (3.0% solution); 7.6 (10% solution)

Melting point/freezing point : >1000°C (>1832°F)

Boiling point or initial boiling point and boiling range : Not applicable. [melting point >300°C]

Flash point : Not applicable. Inorganic substance.

Evaporation rate : Not applicable (solid). [Non-volatile.]

Flammability : Non-flammable. The product is not flammable, combustible or explosive.

Lower and upper explosion limit/flammability limit : Not applicable. Non-flammable.

Vapor pressure : Not applicable. Melting point>300°C

Relative vapor density : Not applicable. Melting point>300°C

Relative density : 1.87

Density : 1.87 g/cm³ [22°C (71.6°F)]

Bulk density : Not available. Depends on batch.

Granulometry : Not available. Depends on batch.

Solubility in water : 223.65 g/l

Partition coefficient: n-octanol/water : Not applicable. [Inorganic substance.]

Auto-ignition temperature : Not applicable (solid). [Not self-heating.]

Decomposition temperature : Not applicable. Melting point>300°C

Viscosity : Dynamic (room temperature): Not applicable (not liquid). [solid substance]
Kinematic (room temperature): Not applicable (not liquid). [solid substance]
Kinematic (40°C (104°F)): Not applicable (not liquid).

Section 9. Physical and chemical properties

Flow time (ISO 2431) : Not available.

Molecular weight : 412.52

Particle characteristics

Median particle size : Not available.

Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : Under ambient temperatures, the product is stable.

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.

Conditions to avoid : Avoid contact with strong reducing agents by storing according to good industrial practice.

Incompatible materials : Strong reducing agents

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**Rat - Oral - LD50** 2550 mg/kg Acute Oral Toxicity **Rabbit - Dermal - LD50** >2000 mg/kg Acute Dermal Toxicity Toxic effects: Poorly absorbed through intact skin. **Rat - Inhalation - LC50 Vapor** >2 mg/l [4 hours] Acute Inhalation Toxicity Toxic effects: Low acute inhalation toxicity.

Conclusion/Summary [Product] : Based on the available data, the classification criteria are not met.

Skin corrosion/irritation

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**New Zealand White Rabbit - Skin - No irritation.** FIFRA Guidelines Amount/concentration applied: 0.5 g moistened with saline Irritation score: 0.5

Conclusion/Summary [Product] : Non-irritant to skin.

Serious eye damage/eye irritation

Product/ingredient name	Result

Section 11. Toxicological information

Disodium octaborate tetrahydrate	**New Zealand White Rabbit - Eyes - Redness of the conjunctivae** Acute Eye Irritation/Corrosion Amount/concentration applied: 0.08 ml equivalent Irritation score: <1 Fully reversible in 7 days or less

Conclusion/Summary [Product] : Based on mean scores less than 1, the effects were fully reversible within 7 days. Based on the available data, the classification criteria are not met.

Respiratory corrosion/irritation

Not available.

Conclusion/Summary [Product] : Based on the available data, the classification criteria are not met.

Respiratory or skin sensitization

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**Guinea pig - skin** Result: Not sensitizing

Skin

Conclusion/Summary [Product] : Non-sensitizer to skin. Based on the available data, the classification criteria are not met.

Respiratory

Conclusion/Summary [Product] : No respiratory sensitization studies have been conducted. There are no data to suggest that boric acid is a respiratory sensitizer. Based on the available data, the classification criteria are not met.

Germ cell mutagenicity

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**In vitro - Mammalian-Animal - Germ** (based on boric acid). 1000 to 10000 ppm Result: Negative

Conclusion/Summary [Product] : Not mutagenic (based on boric acid). Based on the available data, the classification criteria are not met.

Carcinogenicity

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**Mouse - Oral - TC** 446 to 1150 Result: Negative

Conclusion/Summary [Product] : No evidence of carcinogenicity in mice. Based on the available data, the classification criteria are not met.

Reproductive toxicity

Product/ingredient name	Result

Section 11. Toxicological information

Disodium octaborate tetrahydrate

Rat - Oral
Effects: NOAEL in rats for effects on fertility in males is 17.5 mg B/kg body weight.
Fertility effects: Positive

Human - Oral
Effects: No adverse fertility effects in male workers. Epidemiological studies of human developmental effects have shown an absence of effects in exposed borate workers and populations living in areas with high environmental levels of boron.
Maternal toxicity: Negative
Fertility effects: Negative
Developmental: Negative

Rat - Oral
Effects: NOAEL in rats for developmental effects on the foetus including foetal weight loss and minor skeletal variations is 9.6 mg B/kg; NOAEL in rats for maternal toxicity is 13.3 mg B/kg
Maternal toxicity: Positive
Developmental: Positive

Product/ingredient name	Hazard class	Category	Route of exposure	Effects
Disodium octaborate tetrahydrate	TOXIC TO REPRODUCTION	Category 2	-	-

Conclusion/Summary [Product] : Reprotoxicity studies have been conducted with boric acid and disodium tetraborate. A multigeneration study in the rat gave a NOAEL for fertility in males of 17.5 mg B/kg/day. Developmental effects have been observed in laboratory animals, the most sensitive species being the rat with a NOAEL of 9.6 mg B/kg bw/day. 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 workers.

Specific target organ toxicity (single exposure)

Product/ingredient name	Result
Based on the available data, the classification criteria are not met.	

Specific target organ toxicity (repeated exposure)

Product/ingredient name	Result
Based on the available data, the classification criteria are not met.	

Aspiration hazard

Product/ingredient name	Result
Disodium octaborate tetrahydrate	Physical form of solid powder indicates no aspiration hazard potential.

Information on the 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.**

Potential acute health effects

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Section 11. Toxicological information

Skin contact : 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.

Ingestion : This product is not intended for ingestion. Small amounts (e.g., a teaspoon) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms. 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.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : No known significant effects or critical hazards.

Inhalation : No known significant effects or critical hazards.

Skin contact : 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.

Ingestion : 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 and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : 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.

Potential chronic health effects

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**Chronic - Rat - Oral - NOAEL** 17.5 mg/kg

Conclusion/Summary [Product] : A NOAEL of 17.5 mg B/kg body weight/day equivalent to 100 mg boric acid/kg body weight/day was determined in a chronic feeding study (2 years) in rats and is based on testes effects.

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.

General : No known significant effects or critical hazards.

Carcinogenicity : No known significant effects or critical hazards.

Mutagenicity : No known significant effects or critical hazards.

Section 11. Toxicological information

Reproductive toxicity : Suspected of damaging fertility or the unborn child.

Numerical measures of toxicity

Acute toxicity estimates

Product/ingredient name	Oral (mg/kg)	Dermal (mg/kg)	Inhalation (gases) (ppm)	Inhalation (vapors) (mg/l)	Inhalation (dusts and mists) (mg/l)
Disodium octaborate tetrahydrate	2500	N/A	N/A	N/A	N/A

Section 12. Ecological information

Toxicity

Product/ingredient name	Result
Disodium octaborate tetrahydrate	**EC50** Algae *Pseudokirchneriella subcapitata* 52.4 mg/l - (as Boron) Fresh water - Acute **LC50** Invertebrate *Ceriodaphnia dubia* 91 mg/l - (as Boron) Fresh water - Acute **LC50** Fish. *Pimephales promelas* 79.7 mg/l - (as Boron) Fresh water - Acute **NOEC** Fish. *Brachydanio rerio* 6.4 mg/l - (as Boron) Fresh water - Chronic **NOEC** Invertebrate *Daphnia magna* 14.2 mg/l - (as Boron) Fresh water - Chronic **NOEC** Algae *Pseudokirchneriella subcapitata* 17.5 mg/l - (as Boron) Fresh water - Chronic

Conclusion/Summary [Product] : Note that the data values are expressed as boron equivalents. To convert product into equivalent boron (B) content, multiply by 0.21. Studies judged to be unreliable or with insufficient information to evaluate are not included.

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 this product released to the environment.

Section 12. Ecological information

Persistence/degradability

Not available.

Conclusion/Summary [Product] : Not applicable. Inorganic substance

Ingredient name	Conclusion/Summary
Disodium octaborate tetrahydrate	Boron is naturally occurring and ubiquitous in the environment. This product decomposes in the environment to natural borate. Octanol/water partition coefficient: Log P_{ow}: -0.7570 (25°C).

Bioaccumulative potential

Product/ingredient name	$LogP_{ow}$	BCF	Potential
Boric acid	-0.757	-	Low Boric acid will not biomagnify through the food chain.

Mobility in soil

Soil/Water partition coefficient : Not available.

Mobility : The product is soluble in water and is leachable through normal soil. Adsorption to soils or sediments is insignificant.

Other adverse effects

No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : Waste packaging should be recycled. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. The generation of waste should be avoided or minimized wherever possible. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Section 14. Transport information

	Brazil	IMDG	IATA
UN number	Not regulated.	Not regulated.	Not regulated.
UN proper shipping name	-	-	-
Transport hazard class(es)	-	-	-
Packing group	-	-	-
Environmental hazards	No.	No.	No.

Special precautions for user : Not applicable.

Section 14. Transport information

Transport in bulk according to IMO instruments : Not applicable.

Section 15. Regulatory information

Safety, health and environmental regulations specific for the product : No known specific national and/or regional regulations applicable to this product (including its ingredients).

International regulations

Chemical Weapon Convention List Schedules I, II & III Chemicals

Not listed.

Montreal Protocol

Not listed.

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.

Inventory list

Australia : All components are listed or exempted.

Canada : All components are listed or exempted.

China : All components are listed or exempted.

Eurasian Economic Union : **Russian Federation inventory**: All components are listed or exempted.

Japan : **Japan inventory (CSCL)**: All components are listed or exempted.
Japan inventory (ISHL): Not determined.

New Zealand : All components are listed or exempted.

Philippines : All components are listed or exempted.

Republic of Korea : All components are listed or exempted.

Taiwan : All components are listed or exempted.

Thailand : All components are listed or exempted.

Turkey : Not determined.

United States : All components are active or exempted.

Viet Nam : All components are listed or exempted.

Section 16. Other information

History

Date of issue/Date of revision : 21/05/2025

Date of previous issue : 19/05/2025

Version : 1.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL = International Convention for the Prevention of Pollution From Ships,

Section 16. Other information

1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
N/A = Not available
SGG = Segregation Group
UN = United Nations

Procedure used to derive the classification

Classification	Justification
ACUTE TOXICITY (oral) - Category 5 TOXIC TO REPRODUCTION - Category 2	Expert judgment Expert judgment

Additional information : Do not ingest.
Keep out of reach of children.
Refer to safety data sheet.
Not for use in drugs, pesticides or for food preservation.
Use only as directed.

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

Indicates information that has changed from previously issued version.

Brazil / 4.14 / EN-US

Notice to reader

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