# Safety Data Sheet

REVISION: May 2009
Supersedes: November 2006 version

# Solubor® DF
## Sodium Borate

## 1 Identification of the substance/preparation and of the Company/undertaking

**Product name:** Solubor DF
**Grades:** Technical
**Product use:** Micronutrient fertiliser
**Chemical family:** Inorganic borates

**Supplied by:**
**Borax Europe Limited**
2 Eastbourne Terrace
London, W2 6LG
United Kingdom
+44 (0)20 7781 2000

**Email:** hse.europe@riotinto.com

**EMERGENCY PHONE NUMBER:** **+1 661 284 5200**

## 2 Hazards identification

**Classification:** Boric acid and sodium tetraborate pentahydrate were included in 30th ATP to the Dangerous Substances Directive 67/548/EEC as Repr. Cat. 2; R60-61 with specific concentration limits of ≥ 5.5% and ≥ 6.5% respectively. However the Dangerous Substances Directive has been replaced by the Classification, Labelling and Packaging Regulation (EC) 1272/2008 and does not currently include these substances in Annex VI.

**Potential ecological effects:** Large amounts can be harmful to plants and other species. Therefore releases to the environment should be minimized, except when its use on farms has been recommended to correct a boron deficiency.

**Potential health effects:** Inhalation is the most significant route of exposure in occupational and other settings. Dermal exposure is not usually a concern because *Solubor* DF is poorly absorbed through intact skin.

**Inhalation:** Occasional mild irritation effects to nose and throat may occur from inhalation of dusts at levels > 10 mg/m$^3$.

**Ingestion:** Products containing *Solubor* DF are *not* intended for ingestion. *Solubor* DF has low acute toxicity. Small amounts (e.g. a teaspoonful) swallowed accidentally are not likely to cause effects; swallowing amounts larger than that may cause gastrointestinal symptoms.

**Eye contact:** *Solubor* DF is a mild eye irritant.

**Skin contact:** Does not cause irritation to intact skin.

**Reproductive/Developmental:** Animal ingestion studies in several species, at high doses, indicate that boric acid and sodium tetraborate cause reproductive and developmental effects. A human study of occupational exposure to borate dust showed no adverse effect on reproduction.

**Signs and symptoms of exposure:** 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).

# 3 Composition/information on ingredients

| Substance | Formula | % content | CAS# | EINECS# | Classification |
|---|---|---|---|---|---|
| Boric acid | $H_3BO_3$ | 45 | 10043-35-3 | 233-139-2 | None* |
| Sodium tetraborate pentahydrate | $Na_2B_4O_7.5H_2O$ | 35 | 12179-04-3 | 215-540-4 | None* |
| Disodium decaborate decahydrate | $Na_2B_{10}O_{16}.10H_2O$ | 20 | 12631-71-9 | 234-522-7 | None |

*****Boric acid and sodium tetraborate pentahydrate were included in 30th ATP to the Dangerous Substances Directive 67/548/EEC as Repr. Cat. 2; R60-61 with specific concentration limits of ≥ 5.5% and ≥ 6.5% respectively. However the Dangerous Substances Directive has been replaced by the Classification, Labelling and Packaging Regulation (EC) 1272/2008 and does not currently include these substances in Annex VI.

Refer to Section 16 for the full text of R-phrases mentioned above.

# 4 First aid measures

**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.

**Note to physicians:** Observation only is required for adult ingestion of less than 6 grams of *Solubor* DF. For ingestion in excess of 6 grams, maintain adequate kidney function and force fluids. Gastric lavage is recommended for symptomatic patients only. Haemodialysis should be reserved for massive acute ingestion or patients with renal failure. Boron analyses of urine or blood are only useful for documenting exposure and should not be used to evaluate severity of poisoning or to guide treatment[1].

# 5 Fire-fighting measures

**General hazard:** None. The product is not flammable, combustible or explosive. The product is itself a flame retardant.

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

# 6 Accidental release measures

**General:** *Solubor* DF is a water-soluble white microgranular product that may cause damage to trees or vegetation by root absorption (see section 12).

**Land spill:** Vacuum, shovel or sweep up *Solubor* DF and place in containers for disposal in accordance with applicable local regulations. Avoid contamination of water bodies during clean up and disposal. (Refer to section 8 for personal protective equipment).

**Spillage into water:** Where possible, remove any intact containers from the water. 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 (see sections 12, 13 and 15).

# 7 Handling and storage

**General:** 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. Good housekeeping procedures should be followed to minimise dust generation and accumulation.
**Storage temperature:** Ambient **Storage pressure:** Atmospheric **Special sensitivity:** Moisture (Caking)

# 8 Exposure controls/personal protection

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

**Personal protection:** Where airborne concentrations are expected to exceed exposure limits, respirators should be used (EN149). Eye goggles and gloves are not required for normal industrial exposures, but gloves (rubber, nitrile, or butyl) may be warranted if environment is excessively dusty.

**Occupational exposure limits:** Rio Tinto Borax recommends and applies internally an Occupational Exposure Limit (OEL) of 1 mg B/$m^3$. The UK WEL (Workplace Exposure Limit) for sodium tetraborate pentahydrate is 1 mg/$m^3$ (8-hour TWA reference period). To convert *Solubor* DF into equivalent boron (B) content, multiply by 0.1748.

# 9 Physical and chemical properties

| | |
|---|---|
| **Appearance:** | White, odourless, crystalline solid |
| **Bulk density:** | 600 - 650 kg/$m^3$ |
| **Vapour pressure:** | Negligible @ 20$^o$C |
| **Solubility in water:** | 9.5% @ 20$^o$C |
| **Melting point:** | <200$^o$C (heated in closed space) |
| **pH @ 23°C:** | 7.4 (10.0% solution) |

# 10 Stability and reactivity

**General:** *Solubor* DF is a stable product, but when heated it loses water, eventually forming anhydrous borates.

**Incompatible materials and conditions to avoid:** Reaction with strong reducing agents such as metal hydrides or alkali metals will generate hydrogen gas which could create an explosive hazard.

**Hazardous decomposition:** None

# 11 Toxicological Information

**Acute toxicity**
**Ingestion:** No experimental data; $LD_{50}$ of *Solubor* DF is expected to be > 3,000 mg/kg of body weight based on results from similar borate chemicals.

**Skin:** Low acute dermal toxicity; $LD_{50}$ in rabbits is > 2,000 mg/kg of body weight. Poorly absorbed through intact skin.

**Inhalation:** Low acute inhalation toxicity; $LC_{50}$ in rats is > 2.0 mg/l (or g/$m^3$).

**Skin irritation:** No skin irritation.

**Eye irritation:** Mild eye irritant in rabbits. Fifty years of occupational exposure indicate no adverse effects on human eye.

**Sensitisation:** Not a skin sensitiser.

**Reproductive/developmental toxicity:** Animal feeding studies with boric acid and sodium tetraborate in rat, mouse and dog, at high doses, have demonstrated effects on fertility and testes[2]. The lowest NOAEL is 9.6 mg B/kg in rats, based on developmental effects. Studies with 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 doses administered were many times in excess of those which humans would normally be exposed to [3,4,5].

**Carcinogenicity/Mutagenicity:** No data is available on the product itself. Not carcinogenic or mutagenic (based on boric acid).

**Human data:** 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.

# 12 Ecological information

**Ecotoxicity data**

**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 *Solubor* DF into equivalent boron (B) content, multiply by 0.1748.

**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, except as a part of a balanced plant nutrition programme preferably after soil and/or tissue analysis.

**Algal toxicity[6]:**
Green algae, *Scenedesmus subspicatus*
96-hr $EC_{10}$ = 24 mg B/l†

**Invertebrate toxicity:**
Daphnids, *Daphnia magna* Straus[7]
24-hr $EC_{50}$ = 242 mg B/l†

**Fish toxicity:**
Sea water[8]:
Dab, *Limanda limanda*
96-hr $LC_{50}$ = 74 mg B/l†

Fresh water[9]:
Rainbow trout, *Oncorhynchus mykiss* (embryo-larval stage)
24-day $LC_{50}$ = 88 mg B/l†
32-day $LC_{50}$ = 54 mg B/l†

Goldfish, *Carassius auratus* (embryo-larval stage)
7-day $LC_{50}$ = 65 mg B/l†
3-day $LC_{50}$ = 71 mg B/l†

Test substance: † Sodium tetraborate

**Environmental fate data**

**Bioaccumulation/Degradation:** Boron is naturally occurring and ubiquitous in the environment. This product will undergo hydrolysis in water to form undissociated boric acid. *Solubor* DF decomposes in the environment to natural borate.

**Octanol/Water partition coefficient:** Log $P_{ow}$ = -0.7570 @ 25°C (based on boric acid). In aqueous solution sodium tetraborate is converted substantially into undissociated boric acid.

**Soil mobility:** The product is soluble in water and is leachable through normal soil.

# 13 Disposal considerations

**Disposal guidance:** Small quantities of *Solubor* DF can usually be disposed of at landfill sites. Like all the agricultural products, the safest and best method of disposal is on agricultural land as part of a programme of crop nutrition, where use of boron has been indicated. Tonnage quantities of product are not recommended to be sent to landfills. Such product should, if possible, be used for an appropriate application. Local authorities should be consulted about any specific local requirements.

# 14 Transport information

**International transportation:** Not regulated under international transport regulations.

# 15 Regulatory information

**Chemical inventory listing:**
*Solubor* DF is a mixture of chemicals which appear on several chemical inventory lists sometimes under the CAS No. representing the anhydrous form of the chemical.

| | Boric acid | Disodium tetraborate pentahydrate | Disodium decaborate decahydrate |
|---|---|---|---|
| **U.S. EPA TSCA Inventory:** | 10043-35-3 | 1330-43-4 | 12007-92-0 |
| **Canadian DSL:** | 10043-35-3 | 1330-43-4 | 12007-92-0 |
| **EINECS:** | 233-139-2 | 215-540-4 | 234-522-7 |

**General:** Ensure all national/local regulations are observed.

**Clean Air Act (Montreal Protocol):** Not manufactured with and does not contain any Class I or Class II ozone depleting substances.

# 16 Other information

**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. Weir R J, Fisher R S, Toxicol. Appl. Pharmacol., (1972), 23, 351-364
3. National Toxicology Program (NTP) – Technical Report Series No. TR324, NIH Publication No. 88-2580 (1987), PB88 213475/XAB
4. Fail *et al.*, Fund. Appl. Toxicol. (1991) 17, 225-239
5. Heindel *et al.*, Fund. Appl. Toxicol. (1992) 18, 266-277
6. Guhl W, SÖFW-Journal (1992) 181 (18/92), 1159-1168
7. Schöberl P, Marl and Huber L (1988) Tenside Surfactants Detergents 25, 99-107
8. Hugman S J and Mance G (1983) Water Research Centre Report 616-M
9. Birge W J, Black J A, EPA-560/-76-008 (April 1977) PB 267 085

For general information on the toxicology of borates see ECETOC Technical Report No. 63 (1995); Patty's Industrial Hygiene and Toxicology, 4th Edition Vol. II, (1994) Chap. 42, 'Boron'.

**Full text of Risk Phrases mentioned in Section 3:**
R60 May impair fertility.
R61 May cause harm to the unborn child.

**Precautionary Phrases:**
Do not ingest
Keep out of reach of children
Refer to safety data sheet
Not for use in drugs, pesticides or for food preservation.

**Revision Details:**
Format updated in compliance with Regulation (EC) 1907/2006 (REACH).
Section 1: Supplied by information and Emergency phone number.
Section 2, 3: Information on hazard classification.
Section 11: Information on NOAEL.