

## SAFETY DATA SHEET

Version 5.12  
Revision Date 09/21/2017  
Print Date 05/15/2018

---

1. PRODUCT AND COMPANY IDENTIFICATION

## 1.1 Product identifiers

Product name : Borane tetrahydrofuran complex solution

Product Number : 176192

Brand : Aldrich

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

Identified uses : Laboratory chemicals, Synthesis of substances

## 1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich  
3050 Spruce Street  
SAINT LOUIS MO 63103  
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

## 1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

---

2. HAZARDS IDENTIFICATION

## 2.1 Classification of the substance or mixture

**GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)**

Flammable liquids (Category 2), H225

Substances and mixtures, which in contact with water, emit flammable gases (Category 1), H260

Acute toxicity, Oral (Category 4), H302

Skin irritation (Category 2), H315

Serious eye damage (Category 1), H318

Carcinogenicity (Category 2), H351

Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335

For the full text of the H-Statements mentioned in this Section, see Section 16.

## 2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225

Highly flammable liquid and vapour.

H260

In contact with water releases flammable gases which may ignite spontaneously.

H302

Harmful if swallowed.

H315

Causes skin irritation.

H318

Causes serious eye damage.

H335

May cause respiratory irritation.

H351

Suspected of causing cancer.

|                            |                                                                                                                                                                           |
|----------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Precautionary statement(s) |                                                                                                                                                                           |
| P201                       | Obtain special instructions before use.                                                                                                                                   |
| P202                       | Do not handle until all safety precautions have been read and understood.                                                                                                 |
| P210                       | Keep away from heat/sparks/open flames/hot surfaces. No smoking.                                                                                                          |
| P223                       | Do not allow contact with water.                                                                                                                                          |
| P231 + P232                | Handle under inert gas. Protect from moisture.                                                                                                                            |
| P233                       | Keep container tightly closed.                                                                                                                                            |
| P240                       | Ground/bond container and receiving equipment.                                                                                                                            |
| P241                       | Use explosion-proof electrical/ ventilating/ lighting/ equipment.                                                                                                         |
| P242                       | Use only non-sparking tools.                                                                                                                                              |
| P243                       | Take precautionary measures against static discharge.                                                                                                                     |
| P261                       | Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.                                                                                                                    |
| P264                       | Wash skin thoroughly after handling.                                                                                                                                      |
| P270                       | Do not eat, drink or smoke when using this product.                                                                                                                       |
| P271                       | Use only outdoors or in a well-ventilated area.                                                                                                                           |
| P280                       | Wear protective gloves/ protective clothing/ eye protection/ face protection.                                                                                             |
| P301 + P312 + P330         | IF SWALLOWED: Call a POISON CENTER/doctor if you feel unwell. Rinse mouth.                                                                                                |
| P303 + P361 + P353         | IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.                                                                       |
| P304 + P340 + P312         | IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.                                                |
| P305 + P351 + P338 + P310  | IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor. |
| P308 + P313                | IF exposed or concerned: Get medical advice/ attention.                                                                                                                   |
| P332 + P313                | If skin irritation occurs: Get medical advice/ attention.                                                                                                                 |
| P335 + P334                | Brush off loose particles from skin. Immerse in cool water/ wrap in wet bandages.                                                                                         |
| P362                       | Take off contaminated clothing and wash before reuse.                                                                                                                     |
| P370 + P378                | In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.                                                                                      |
| P402 + P404                | Store in a dry place. Store in a closed container.                                                                                                                        |
| P403 + P233                | Store in a well-ventilated place. Keep container tightly closed.                                                                                                          |
| P403 + P235                | Store in a well-ventilated place. Keep cool.                                                                                                                              |
| P405                       | Store locked up.                                                                                                                                                          |
| P501                       | Dispose of contents/ container to an approved waste disposal plant.                                                                                                       |

### 2.3 Hazards not otherwise classified (HNOC) or not covered by GHS - none

## 3. COMPOSITION/INFORMATION ON INGREDIENTS

### 3.2 Mixtures

|                  |                 |
|------------------|-----------------|
| Formula          | : $C_4H_{11}BO$ |
| Molecular weight | : 85.94 g/mol   |

#### Hazardous components

| Component              |                       | Classification                                                                              | Concentration |
|------------------------|-----------------------|---------------------------------------------------------------------------------------------|---------------|
| Tetrahydrofuran        |                       |                                                                                             |               |
| CAS-No.                | 109-99-9              | Flam. Liq. 2; Acute Tox. 4; Eye Irrit. 2A; Carc. 2; STOT SE 3; H225, H302, H319, H335, H351 | 90 - 100 %    |
| EC-No.                 | 203-726-8             |                                                                                             |               |
| Index-No.              | 603-025-00-0          |                                                                                             |               |
| Registration number    | 01-2119444314-46-XXXX |                                                                                             |               |
| Tetrahydrofuran-borane |                       |                                                                                             |               |
| CAS-No.                | 14044-65-6            | Flam. Liq. 2; Water-react. 1; Skin Irrit. 2; Eye Irrit. 2A; H225, H260, H315, H319          | 5 - 10 %      |
| EC-No.                 | 237-881-8             |                                                                                             |               |

For the full text of the H-Statements mentioned in this Section, see Section 16.

---

#### 4. FIRST AID MEASURES

##### 4.1 Description of first aid measures

###### General advice

Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

###### If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

###### In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

###### In case of eye contact

Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

###### If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

##### 4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

##### 4.3 Indication of any immediate medical attention and special treatment needed

No data available

---

#### 5. FIREFIGHTING MEASURES

##### 5.1 Extinguishing media

###### Suitable extinguishing media

Dry powder Dry sand

###### Unsuitable extinguishing media

Do NOT use water jet.

##### 5.2 Special hazards arising from the substance or mixture

No data available

##### 5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

##### 5.4 Further information

No data available

---

#### 6. ACCIDENTAL RELEASE MEASURES

##### 6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

##### 6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

##### 6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13). Do not flush with water.

##### 6.4 Reference to other sections

For disposal see section 13.

---

## 7. HANDLING AND STORAGE

### 7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

### 7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Never allow product to get in contact with water during storage.

Recommended storage temperature 2 - 8 °C

Do not allow water to enter container. Handle and store under inert gas. The pressure in sealed containers can increase under the influence of heat. Dry residue is explosive. Store under inert gas. Test for peroxide formation periodically and before distillation.

### 7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

---

## 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

### 8.1 Control parameters

#### Components with workplace control parameters

| Component                                                 | CAS-No.  | Value                                                                                                                                                                                      | Control parameters                 | Basis                                                                            |
|-----------------------------------------------------------|----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------|----------------------------------------------------------------------------------|
| Hazardous components without workplace control parameters |          |                                                                                                                                                                                            |                                    |                                                                                  |
| Tetrahydrofuran                                           | 109-99-9 | TWA                                                                                                                                                                                        | 50.000000 ppm                      | USA. ACGIH Threshold Limit Values (TLV)                                          |
|                                                           | Remarks  | Central Nervous System impairment<br>Upper Respiratory Tract irritation<br>Kidney damage<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption |                                    |                                                                                  |
|                                                           |          | STEL                                                                                                                                                                                       | 100.000000 ppm                     | USA. ACGIH Threshold Limit Values (TLV)                                          |
|                                                           |          | Central Nervous System impairment<br>Upper Respiratory Tract irritation<br>Kidney damage<br>Confirmed animal carcinogen with unknown relevance to humans<br>Danger of cutaneous absorption |                                    |                                                                                  |
|                                                           |          | TWA                                                                                                                                                                                        | 200.000000 ppm<br>590.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits                                           |
|                                                           |          | ST                                                                                                                                                                                         | 250.000000 ppm<br>735.000000 mg/m3 | USA. NIOSH Recommended Exposure Limits                                           |
|                                                           |          | TWA                                                                                                                                                                                        | 200.000000 ppm<br>590.000000 mg/m3 | USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants |
|                                                           |          | The value in mg/m3 is approximate.                                                                                                                                                         |                                    |                                                                                  |

|  |  |      |                      |                                                                                         |
|--|--|------|----------------------|-----------------------------------------------------------------------------------------|
|  |  | PEL  | 200 ppm<br>590 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |
|  |  | STEL | 250 ppm<br>735 mg/m3 | California permissible exposure limits for chemical contaminants (Title 8, Article 107) |

#### Biological occupational exposure limits

| Component       | CAS-No.  | Parameters                                               | Value       | Biological specimen | Basis                                     |
|-----------------|----------|----------------------------------------------------------|-------------|---------------------|-------------------------------------------|
| Tetrahydrofuran | 109-99-9 | Tetrahydrofuran                                          | 2.0000 mg/l | Urine               | ACGIH - Biological Exposure Indices (BEI) |
|                 | Remarks  | End of shift (As soon as possible after exposure ceases) |             |                     |                                           |

## 8.2 Exposure controls

### Appropriate engineering controls

Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

### Personal protective equipment

#### Eye/face protection

Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

#### Skin protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 10 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

#### Body Protection

Complete suit protecting against chemicals, Flame retardant antistatic protective clothing., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

#### Respiratory protection

Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

#### Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

## 9. PHYSICAL AND CHEMICAL PROPERTIES

### 9.1 Information on basic physical and chemical properties

- |               |                                    |
|---------------|------------------------------------|
| a) Appearance | Form: liquid<br>Colour: colourless |
| b) Odour      | No data available                  |

|                                                 |                                                                       |
|-------------------------------------------------|-----------------------------------------------------------------------|
| c) Odour Threshold                              | No data available                                                     |
| d) pH                                           | No data available                                                     |
| e) Melting point/freezing point                 | No data available                                                     |
| f) Initial boiling point and boiling range      | 65.5 - 66.5 °C (149.9 - 151.7 °F)                                     |
| g) Flash point                                  | -17 °C (1 °F) - closed cup                                            |
| h) Evaporation rate                             | No data available                                                     |
| i) Flammability (solid, gas)                    | No data available                                                     |
| j) Upper/lower flammability or explosive limits | Upper explosion limit: 12.42 %(V)<br>Lower explosion limit: 1.58 %(V) |
| k) Vapour pressure                              | No data available                                                     |
| l) Vapour density                               | No data available                                                     |
| m) Relative density                             | 0.898 g/cm <sup>3</sup> at 25 °C (77 °F)                              |
| n) Water solubility                             | No data available                                                     |
| o) Partition coefficient: n-octanol/water       | No data available                                                     |
| p) Auto-ignition temperature                    | No data available                                                     |
| q) Decomposition temperature                    | No data available                                                     |
| r) Viscosity                                    | No data available                                                     |
| s) Explosive properties                         | No data available                                                     |
| t) Oxidizing properties                         | No data available                                                     |

## 9.2 Other safety information

No data available

---

## 10. STABILITY AND REACTIVITY

### 10.1 Reactivity

No data available

### 10.2 Chemical stability

Stable under recommended storage conditions.

Contains the following stabiliser(s):

Sodium borohydride (<0.019 %)

### 10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air. Reacts violently with water.

### 10.4 Conditions to avoid

Heat, flames and sparks. Exposure to moisture

### 10.5 Incompatible materials

acids, Acid chlorides, Acid anhydrides, Alcohols, Oxidizing agents, Oxygen

### 10.6 Hazardous decomposition products

In the event of fire: see section 5

---

## 11. TOXICOLOGICAL INFORMATION

### 11.1 Information on toxicological effects

#### Acute toxicity

LD50 Oral - Rat - > 500 - < 2,000 mg/kg

No data available

Inhalation: No data available

Dermal: No data available

No data available

**Skin corrosion/irritation**

Skin - Rabbit

Result: Skin irritation

(OECD Test Guideline 404)

**Serious eye damage/eye irritation**

No data available

**Respiratory or skin sensitisation**

No data available

**Germ cell mutagenicity**

No data available

**Carcinogenicity**

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

**Reproductive toxicity**

No data available

No data available

**Specific target organ toxicity - single exposure**

May cause respiratory irritation.

**Specific target organ toxicity - repeated exposure**

No data available

**Aspiration hazard**

No data available

**Additional Information**

RTECS: Not available

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

Liver - Irregularities - Based on Human Evidence

Stomach - Irregularities - Based on Human Evidence (Tetrahydrofuran)

Liver - Irregularities - Based on Human Evidence (Tetrahydrofuran-borane)

---

## 12. ECOLOGICAL INFORMATION

### 12.1 Toxicity

No data available

### 12.2 Persistence and degradability

No data available

### 12.3 Bioaccumulative potential

No data available

### 12.4 Mobility in soil

No data available

## 12.5 Results of PBT and vPvB assessment

PBT/vPvB assessment not available as chemical safety assessment not required/not conducted

## 12.6 Other adverse effects

No data available

---

## 13. DISPOSAL CONSIDERATIONS

### 13.1 Waste treatment methods

#### Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

#### Contaminated packaging

Dispose of as unused product.

---

## 14. TRANSPORT INFORMATION

### DOT (US)

UN number: 3399      Class: 4.3 (3)      Packing group: I  
Proper shipping name: Organometallic substance, liquid, water-reactive, flammable (Tetrahydrofuran-borane, Tetrahydrofuran)  
Reportable Quantity (RQ): 1106 lbs  
Poison Inhalation Hazard: No

### IMDG

UN number: 3399      Class: 4.3 (3)      Packing group: I      EMS-No: F-G, S-N  
Proper shipping name: ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE  
(Tetrahydrofuran-borane, Tetrahydrofuran)

### IATA

UN number: 3399      Class: 4.3 (3)      Packing group: I  
Proper shipping name: Organometallic substance, liquid, water-reactive, flammable (Tetrahydrofuran-borane, Tetrahydrofuran)  
IATA Passenger: Not permitted for transport

---

## 15. REGULATORY INFORMATION

### SARA 302 Components

No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

### SARA 313 Components

This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

### SARA 311/312 Hazards

Fire Hazard, Reactivity Hazard, Acute Health Hazard, Chronic Health Hazard

### Massachusetts Right To Know Components

|                 | CAS-No.  | Revision Date |
|-----------------|----------|---------------|
| Tetrahydrofuran | 109-99-9 | 1993-04-24    |

### Pennsylvania Right To Know Components

|                        | CAS-No.    | Revision Date |
|------------------------|------------|---------------|
| Tetrahydrofuran        | 109-99-9   | 1993-04-24    |
| Tetrahydrofuran-borane | 14044-65-6 |               |

|                        | CAS-No.    | Revision Date |
|------------------------|------------|---------------|
| Tetrahydrofuran        | 109-99-9   | 1993-04-24    |
| Tetrahydrofuran-borane | 14044-65-6 |               |

### New Jersey Right To Know Components

| CAS-No. | Revision Date |
|---------|---------------|
|---------|---------------|



Tetrahydrofuran  
Tetrahydrofuran-borane

109-99-9  
14044-65-6

1993-04-24

### California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

---

## 16. OTHER INFORMATION

### Full text of H-Statements referred to under sections 2 and 3.

|              |                                                                                |
|--------------|--------------------------------------------------------------------------------|
| Acute Tox.   | Acute toxicity                                                                 |
| Carc.        | Carcinogenicity                                                                |
| Eye Irrit.   | Eye irritation                                                                 |
| Flam. Liq.   | Flammable liquids                                                              |
| H225         | Highly flammable liquid and vapour.                                            |
| H260         | In contact with water releases flammable gases which may ignite spontaneously. |
| H302         | Harmful if swallowed.                                                          |
| H315         | Causes skin irritation.                                                        |
| H318         | Causes serious eye damage.                                                     |
| H319         | Causes serious eye irritation.                                                 |
| H335         | May cause respiratory irritation.                                              |
| H351         | Suspected of causing cancer.                                                   |
| Skin Irrit.  | Skin irritation                                                                |
| STOT SE      | Specific target organ toxicity - single exposure                               |
| Water-react. | Substances and mixtures, which in contact with water, emit flammable gases     |

### HMIS Rating

|                        |   |
|------------------------|---|
| Health hazard:         | 2 |
| Chronic Health Hazard: | * |
| Flammability:          | 3 |
| Physical Hazard        | 2 |

### NFPA Rating

|                    |   |
|--------------------|---|
| Health hazard:     | 2 |
| Fire Hazard:       | 3 |
| Reactivity Hazard: | 2 |
| Special hazard.I:  | W |

### Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.  
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See [www.sigma-aldrich.com](http://www.sigma-aldrich.com) and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

### Preparation Information

Sigma-Aldrich Corporation  
Product Safety – Americas Region  
1-800-521-8956

Version: 5.12

Revision Date: 09/21/2017

Print Date: 05/15/2018