MATERIAL SAFETY DATA SHEET

Section 1 - Chemical Product and Company Identification

MSDS Name: Borane-tetrahydrofuran complex, 1M solution in tetrahydrofuran
Catalog Numbers: AC175080000, AC175081000, AC175088000
Synonyms: Trihydro(tetrahydrofuran)boron in THF.

Company Identification: Acros Organics BVBA
Janssen Pharmaceuticalalaan 3a
2440 Geel, Belgium

Company Identification: (USA)
Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

For information in the US, call: 800-ACROS-01
For information in Europe, call: +32 14 57 52 11
Emergency Number, Europe: +32 14 57 52 99
Emergency Number US: 201-796-7100
CHEMTREC Phone Number, US: 800-424-9300
CHEMTREC Phone Number, Europe: 703-527-3887

Section 2 - Composition, Information on Ingredients

Risk Phrases: 11 19 36/37
CAS#: 109-99-9
Chemical Name: Tetrahydrofuran
%: 91
EINECS#: 203-726-8
Hazard Symbols: F XI

Risk Phrases: 14/15
CAS#: 14044-65-6
Chemical Name: Borane-tetrahydrofuran complex
%: 9
EINECS#: 237-881-8
Hazard Symbols: F

Text for R-phrases: see Section 16

Hazard Symbols: XI F

Risk Phrases: 11 15 19 36/37/38

Section 3 - Hazards Identification

EMERGENCY OVERVIEW


11/5/2007
(34700) Borane-tetrahydrofuran complex, 1M solution in tetrahydrofuran

below 4°C/39°F.) Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye: Causes eye irritation.

Skin: Causes skin irritation.

Ingestion: May cause irritation of the digestive tract. May cause liver and kidney damage. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. May cause headache.

Inhalation: Causes respiratory tract irritation. May cause effects similar to those described for ingestion. May be harmful if inhaled. Exposure to high concentrations may produce narcosis, nausea and loss of consciousness.

Chronic: Prolonged or repeated skin contact may cause defatting and dermatitis.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin: Get medical aid. Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Reacts violently with water giving off flammable gas which may explode. Extremely flammable liquid and vapor. This substance reacts with water to form gases which might cause closed containers to rupture. Will be easily ignited by heat, sparks or flame. Vapors may form an explosive mixture with air. Containers may explode when heated. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Extinguishing Media: Use dry chemical to fight fire. DO NOT USE WATER!

Autoignition: 321 deg F (160.56 deg C)

Temperature:

Flash Point: -17 deg C (1.40 deg F)

Explosion: 2.0%

Limits: Lower:

Explosion: 11.8%

Limits: Upper:

NFPA Rating: ; Special Hazard: -W-

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Clean up spills immediately, observing precautions in the Protective Equipment section. Remove all sources of ignition. Use a spark-proof tool. Provide ventilation. Approach spill from upwind.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not allow water to get into the container because of violent reaction. Ground and bond containers when transferring material. Use spark-proof tools and explosion proof equipment. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Keep away from heat, sparks and flame. Container should be opened by a technically qualified person. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames. Use only with adequate ventilation. Avoid breathing vapor.

Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed
container. Store in a dry area. Keep under a nitrogen blanket. Store in a cool, dry, well-ventilated area away from incompatible substances. Refrigerator/flammables. Regularly check inhibitor levels to maintain peroxide levels below 1%. After opening, purge container with nitrogen before reclosing. Periodically test for peroxide formation on long-term storage. Addition of water or appropriate reducing materials will lessen peroxide formation. Containers should be dated when opened and tested periodically for the presence of peroxides. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. All peroxidizable substances should be stored away from heat and light and be protected from ignition sources.

### Section 8 - Exposure Controls, Personal Protection

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>50 ppm; 100 ppm</td>
<td>200 ppm TWA; 590 mg/m³ TWA</td>
<td>200 ppm TWA; 590 mg/m³ TWA</td>
</tr>
<tr>
<td>STEL; Skin - potential</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>contribution to overall exposure</td>
<td>ppm IDLH</td>
<td></td>
<td></td>
</tr>
<tr>
<td>by the cutaneous route</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Borane-tetrahydrofuran ran complex</td>
<td>none listed</td>
<td>none listed</td>
<td>none listed</td>
</tr>
</tbody>
</table>

OSHA Vacated PELs: Tetrahydrofuran: 200 ppm TWA; 590 mg/m³ TWA Borane-tetrahydrofuran complex: None listed

**Engineering Controls:**

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

**Exposure Limits**

**Personal Protective Equipment**

**Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA’s eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

**Skin:** Wear appropriate protective gloves to prevent skin exposure.

**Clothing:** Wear appropriate protective clothing to prevent skin exposure.

**Respirators:** Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

### Section 9 - Physical and Chemical Properties

**Physical State:** Liquid

**Color:** clear, colorless

**Odor:** Stench.

**pH:** Not available

**Vapor Pressure:** 145 mm Hg @ 20 deg C

**Vapor Density:** Not available

**Evaporation Rate:** Not available

**Viscosity:** Not available

**Boiling Point:** 66 deg C (150.80°F)

**Freezing/Melting Point:** -108 deg C (-162.40°F)

**Decomposition Temperature:** Not available

**Solubility in water:** Reacts

**Specific Gravity/Density:** .8980/g/cm³

**Molecular Formula:** C₄H₁₁BO

**Molecular Weight:** 85.94
Section 10 - Stability and Reactivity

Chemical Stability: Unstable. This material may be sensitive to peroxide formation. Under normal storage conditions, peroxidizable compounds can form and accumulate peroxides which may explode when subjected to heat or shock. This material is most hazardous when peroxide levels are concentrated by distillation or evaporation.

Conditions to Avoid: High temperatures, mechanical shock, incompatible materials, ignition sources, moisture, contact with water, excess heat, exposure to moist air or water.

Incompatibilities with Other Materials: Not available

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, oxides of boron, borane, hydrogen gas.

Hazardous Polymerization: May occur.

Section 11 - Toxicological Information

RTECS#: CAS# 109-99-9: LU5950000
CAS# 14044-65-6: None listed

LD50/LC50:
RTECS:
CAS# 109-99-9: Inhalation, rat: LC50 = 21000 ppm/3H;
Oral, rat: LD50 = 1650 mg/kg;

RTECS:
CAS# 14044-65-6:

Carcinogenicity: Tetrahydrofuran - ACGIH: A3 - Confirmed animal carcinogen with unknown relevance to humans
Borane-tetrahydrofuran complex - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.

Other: Please contact Acros for more information.

Section 12 - Ecological Information

Ecotoxicity: Not available

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: ORGANOMETALLIC SUBSTANCE, LIQUID, WATER-REACTIVE, FLAMMABLE
Hazard Class: 4.3
UN Number: UN3399
Packing Group: II
Canada TDG
Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

USA RQ: CAS# 109-99-9: 1000 lb final RQ; 454 kg final RQ

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: Xi F

Risk Phrases:
R 11 Highly flammable.
R 15 Contact with water liberates extremely flammable gases.
R 19 May form explosive peroxides.

R 36/37/38 Irritating to eyes, respiratory system and skin.

Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 28 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
S 29 Do not empty into drains.
S 33 Take precautionary measures against static discharges.
S 37/39 Wear suitable gloves and eye/face protection.

WGK (Water Danger/Protection)
CAS# 109-99-9: 1
CAS# 14044-65-6: Not available

Canada
CAS# 109-99-9 is listed on Canada's DSL List
CAS# 14044-65-6 is listed on Canada's NDSL List
Canadian WHMIS Classifications: B2
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.
CAS# 109-99-9 is listed on Canada's Ingredient Disclosure List
CAS# 14044-65-6 is not listed on Canada's Ingredient Disclosure List.

US Federal
TSCA
CAS# 109-99-9 is listed on the TSCA Inventory.
CAS# 14044-65-6 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 6/01/1999
Revision #5 Date 3/22/2006

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential, or exemplary damages howsoever arising, even if the company has been advised of the possibility of such damages.