SECTION 1: Identification

1.1. Identification

Product name: BORON ALLYLOXIDE
Product code: AKB154
Product form: Substance
Physical state: Liquid
Formula: C9H15BO3
Synonyms: TRIALLYL BORATE, TRIALLYLOXYBORANE, BORIC ACID-TRIALYL ESTER; BORIC ACID (H3BO3), TRI-2-PROPEN-1-YL ESTER
Chemical family: ESTER

1.2. Recommended use and restrictions on use

Recommended use: Chemical intermediate

1.3. Supplier

GELEST, INC.
11 East Steel Road
Morrisville, PA 19067
USA
T 215-547-1015 - F 215-547-2484 - (M-F): 8:00 AM - 5:30 PM EST
info@gelest.com - www.gelest.com

1.4. Emergency telephone number

Emergency number: CHEMTREC: 1-800-424-9300 (USA); +1 703-527-3887 (International)

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification:
- Flammable liquids Category 3
- Acute toxicity (inhalation/vapor) Category 4
- Skin corrosion/irritation Category 2
- Serious eye damage/eye irritation Category 2A
- Specific target organ toxicity (single exposure) Category 3
- Hazardous to the aquatic environment - Acute Hazard Category 3

Full text of H statements: see section 16

2.2. GHS Label elements, including precautionary statements

GHS labeling:
- Hazard pictograms (GHS US):
  - Flammable liquid (H226)
  - Harmful if inhaled (H332)
  - Causes skin irritation (H315)
  - Causes serious eye irritation (H319)
  - May cause respiratory irritation (H335)
  - Harmful to aquatic life (H402)

Precautionary statements (GHS US):
- P280 - Wear protective gloves/protective clothing/eye protection/face protection.
- P210 - Keep away from heat, open flames, sparks. - No smoking.
- P240 - Ground/Bond container and receiving equipment
- P241 - Use explosion-proof electrical equipment
- P242 - Use only non-sparking tools.
- P243 - Take precautionary measures against static discharge.
- P261 - Avoid breathing vapors.
- P264 - Wash hands thoroughly after handling.
- P271 - Use only outdoors or in a well-ventilated area.
- P273 - Avoid release to the environment.
- P303+P361+P353 - If on skin (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower
- P304+P340 - If inhaled: Remove person to fresh air and keep comfortable for breathing
  - P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove any contact lenses if easily removed, then rinse well.
boron allyloxide

safety data sheet

print date: 04/09/2019

en (english us)

sds id: akb154

2.3. hazards not otherwise classified (hnoc)

no additional information available

2.4. unknown acute toxicity (ghs us)

not applicable

section 3: composition/information on ingredients

3.1. substances

substance type:

multi-constituent

name:

boron allyloxide

cas-no.:

1693-71-6

name product identifier %
ghs-us classification

triaryl borate (cas-no.) 1693-71-6 95-100

flam. liq. 3, h226

skin irrit. 2, h315

eye irrit. 2a, h319

stot se 3, h335

allyl alcohol (cas-no.) 107-18-6 1-2

flam. liq. 2, h225

acute tox. 3 (oral), h301

acute tox. 2 (dermal), h310

acute tox. 1 (inhalation: vapour), h330

skin irrit. 2, h315

eye irrit. 2a, h319

stot se 3, h335

aquatic acute 1, h400

full text of hazard classes and h-statements: see section 16

section 4: first-aid measures

4.1. description of first aid measures

first-aid measures general:

remove contaminated clothing and shoes. in case of accident or if you feel unwell, seek medical advice immediately (show the label where possible). if possible show this sheet; if not available show packaging or label. if exposed or concerned: get medical advice/attention.

first-aid measures after inhalation:

remove victim to fresh air and keep at rest in a position comfortable for breathing. if you feel unwell, seek medical advice.

first-aid measures after skin contact:

wash with plenty of soap and water. get medical advice/attention.

first-aid measures after eye contact:

immediately flush eyes thoroughly with water for at least 15 minutes. remove contact lenses, if present and easy to do. continue rinsing. get medical advice/attention.

first-aid measures after ingestion:

never give anything by mouth to an unconscious person. get medical advice/attention.

4.2. most important symptoms and effects (acute and delayed)

symptoms/effects after inhalation:

may cause respiratory irritation. allyl alcohol is considered a poison by inhalation and a systemic irritant.

symptoms/effects after skin contact:

causes skin irritation.

symptoms/effects after eye contact:

causes serious eye irritation.

symptoms/effects after ingestion:

may be harmful if swallowed.

section 5: fire-fighting measures

5.1. suitable (and unsuitable) extinguishing media

suitable extinguishing media:

alcohol-resistant foam. carbon dioxide. dry chemical.

unsuitable extinguishing media:

avoid water spray as toxic allyl alcohol will be generated.

fire hazard:

flammable liquid and vapor. irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.
BORON ALLYLOXIDE
Safety Data Sheet

5.3. Special protective equipment and precautions for fire-fighters
Firefighting instructions: Exercise caution when fighting any chemical fire.
Protection during firefighting: Do not enter fire area without proper protective equipment, including respiratory protection. Avoid all eye and skin contact and do not breathe vapor and mist.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures
General measures: Remove ignition sources. Use special care to avoid static electric charges.

6.1.1. For non-emergency personnel
Protective equipment: Wear protective equipment as described in Section 8.
Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders
Protective equipment: Do not attempt to take action without suitable protective equipment. Equip cleanup crew with proper protection. For further information refer to section 8: "Exposure controls/personal protection".

6.2. Environmental precautions
Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up
For containment: Contain any spills with dikes or absorbents to prevent migration and entry into sewers or streams.
Methods for cleaning up: Clean up any spills as soon as possible, using an absorbent material to collect it. Sweep or shovel spills into appropriate container for disposal. Use only non-sparking tools.

6.4. Reference to other sections
See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling
Precautions for safe handling: Avoid all eye and skin contact and do not breathe vapor and mist. Provide good ventilation in process area to prevent accumulation of vapors. Take precautionary measures against static discharge. Containers and transfer lines require grounding during use. Use only non-sparking tools.
Hygiene measures: Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Wash contaminated clothing before reuse.

7.2. Conditions for safe storage, including any incompatibilities
Technical measures: Ground/bond container and receiving equipment.
Storage conditions: Keep container tightly closed.
Storage area: Store in a well-ventilated place. Store away from heat.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

<table>
<thead>
<tr>
<th>Triallyl borate (1693-71-6)</th>
<th>ACGIH TWA (ppm)</th>
<th>100 ppm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Allyl alcohol (107-18-6)</td>
<td>ACGIH TWA (ppm)</td>
<td>0.5 ppm</td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (mg/m³)</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td>OSHA</td>
<td>OSHA PEL (TWA) (ppm)</td>
<td>2 ppm</td>
</tr>
<tr>
<td>IDLH</td>
<td>US IDLH (ppm)</td>
<td>20 ppm</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (mg/m³)</td>
<td>5 mg/m³</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (TWA) (ppm)</td>
<td>2 ppm</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (STEL) (mg/m³)</td>
<td>10 mg/m³</td>
</tr>
<tr>
<td>NIOSH</td>
<td>NIOSH REL (STEL) (ppm)</td>
<td>4 ppm</td>
</tr>
</tbody>
</table>

8.2. Appropriate engineering controls
Appropriate engineering controls: Handle in an enclosing hood with exhaust ventilation.
8.3. Individual protection measures/Personal protective equipment

Personal protective equipment:
Avoid all unnecessary exposure. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure.

Hand protection:
Neoprene or nitrile rubber gloves

Eye protection:
Chemical goggles. Contact lenses should not be worn

Skin and body protection:
Wear suitable protective clothing

Respiratory protection:
Where exposure through inhalation may occur from use, respiratory protection equipment is recommended

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>182.03 g/mol</td>
</tr>
<tr>
<td>Color</td>
<td>Water white</td>
</tr>
<tr>
<td>Odor</td>
<td>Slight. Pungent.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>Refractive index</td>
<td>1.427</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate=1)</td>
<td>No data available</td>
</tr>
<tr>
<td>Melting point</td>
<td>No data available</td>
</tr>
<tr>
<td>Freezing point</td>
<td>&lt; 0 °C</td>
</tr>
<tr>
<td>Boiling point</td>
<td>72 °C @ 12</td>
</tr>
<tr>
<td>Flash point</td>
<td>31 °C</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>No data available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Flammable liquid and vapor</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No data available</td>
</tr>
<tr>
<td>Relative vapor density at 20 °C</td>
<td>&gt; 1</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.919</td>
</tr>
<tr>
<td>Solubility</td>
<td>Reacts with water</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No data available</td>
</tr>
<tr>
<td>Log Kow</td>
<td>No data available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>0.9 cSt @ 23 °C</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Oxidizing properties</td>
<td>No data available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>No data available</td>
</tr>
</tbody>
</table>

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Stable.

10.3. Possibility of hazardous reactions

Material decomposes slowly in contact with air by reaction with moisture, liberating allyl alcohol and boric acid. Avoid contact with water. Violent and potentially explosive reactions may occur on contact with oxidizers, mineral acids and carbon tetrachloride.
10.4. Conditions to avoid
Heat. Open flame. Sparks.

10.5. Incompatible materials

10.6. Hazardous decomposition products
Boron oxide fumes. Organic acid vapors.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

<table>
<thead>
<tr>
<th>Acute toxicity</th>
<th>Not classified</th>
</tr>
</thead>
</table>

BORON ALLYLOXIDE (1693-71-6)

<table>
<thead>
<tr>
<th>ATE US (vapors)</th>
<th>19.55 mg/l/4h</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Allyl alcohol (107-18-6)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>64 mg/kg</td>
</tr>
<tr>
<td>LD50 oral mouse</td>
<td>96 mg/kg</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>89 mg/kg</td>
</tr>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>0.391 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>64 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (dermal)</td>
<td>89 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>0.391 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (dust, mist)</td>
<td>0.391 mg/l/4h</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skin corrosion/irritation</th>
<th>Causes skin irritation.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serious eye damage/irritation</td>
<td>Causes serious eye irritation.</td>
</tr>
<tr>
<td>Respiratory or skin sensitization</td>
<td>Not classified</td>
</tr>
<tr>
<td>Germ cell mutagenicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Carcinogenicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Reproductive toxicity</td>
<td>Not classified</td>
</tr>
<tr>
<td>Specific target organ toxicity – single exposure</td>
<td>May cause respiratory irritation.</td>
</tr>
<tr>
<td>Specific target organ toxicity – repeated exposure</td>
<td>Not classified</td>
</tr>
<tr>
<td>Aspiration hazard</td>
<td>Not classified</td>
</tr>
<tr>
<td>Potential Adverse human health effects and symptoms</td>
<td>Boron allyloxide hydrolyzes in contact with moisture in air to form allyl alcohol and boron oxide. Allyl alcohol is considered a highly toxic byproduct.</td>
</tr>
<tr>
<td>Symptoms/effects after inhalation</td>
<td>May cause respiratory irritation. Allyl alcohol is considered a poison by inhalation and a systemic irritant.</td>
</tr>
<tr>
<td>Symptoms/effects after skin contact</td>
<td>Causes skin irritation.</td>
</tr>
<tr>
<td>Symptoms/effects after eye contact</td>
<td>Causes serious eye irritation.</td>
</tr>
<tr>
<td>Symptoms/effects after ingestion</td>
<td>May be harmful if swallowed.</td>
</tr>
<tr>
<td>Reason for classification</td>
<td>Expert judgment</td>
</tr>
</tbody>
</table>

SECTION 12: Ecological information

12.1. Toxicity
Ecology - general : Harmful to aquatic life.

BORON ALLYLOXIDE (1693-71-6)

<table>
<thead>
<tr>
<th>Allyl alcohol (107-18-6)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 1</td>
<td>0.28 - 0.37 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])</td>
</tr>
<tr>
<td>LC50 fish 2</td>
<td>0.32 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
No additional information available

12.3. Bioaccumulative potential

BORON ALLYLOXIDE (1693-71-6)

<table>
<thead>
<tr>
<th>Allyl alcohol (107-18-6)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>BCF fish 1</td>
<td>(no bioaccumulation expected)</td>
</tr>
<tr>
<td>Log Pow</td>
<td>0.17</td>
</tr>
</tbody>
</table>

12.4. Mobility in soil
No additional information available
12.5. Other adverse effects

Other adverse effects : This substance may be hazardous to the environment.
Effect on the ozone layer : No additional information available

SECTION 13: Disposal considerations

13.1. Disposal methods

Sewage disposal recommendations : Do not dispose of waste into sewer.
Product/Packaging disposal recommendations : Dispose of in a safe manner in accordance with local/national regulations. Dispose of contents/container to licensed waste disposal facility.
Ecology - waste materials : Avoid release to the environment.

SECTION 14: Transport information

14.1. UN number

UN-No.(DOT) : 1992
DOT NA no. : UN1992

14.2. UN proper shipping name

Transport document description : UN1992 Flammable liquids, toxic, n.o.s. (BORON ALLYLOXIDE), 3 (6.1), III
Proper Shipping Name (DOT) : Flammable liquids, toxic, n.o.s. (BORON ALLYLOXIDE)
Class (DOT) : 3 - Class 3 : Flammable and combustible liquid 49 CFR 173.120
Packing group (DOT) : III - Minor Danger
Hazard labels (DOT) : 3 - Flammable liquid 6.1 - Poison

DOT Packaging Non Bulk (49 CFR 173.xxx) : 203
DOT Packaging Bulk (49 CFR 173.xxx) : 242
DOT Packaging Exceptions (49 CFR 173.xxx) : 150
DOT Symbols : G - Identifies PSN requiring a technical name

14.3. Additional information

Emergency Response Guide (ERG) Number : 131
Other information : No supplementary information available.

Transport by sea

DOT Vessel Stowage Location : A - The material may be stowed "on deck" or "under deck" on a cargo vessel and on a passenger vessel.

Air transport

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27) : 60 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75) : 220 L

SECTION 15: Regulatory information

15.1. US Federal regulations

Triallyl borate (1693-71-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Allyl alcohol (107-18-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on the United States SARA Section 302
Subject to reporting requirements of United States SARA Section 313
SARA Section 302 Threshold Planning Quantity (TPQ) : 1000
SARA Section 313 - Emission Reporting : 1 %
15.2. International regulations

**CANADA**

**Triallyl borate (1693-71-6)**

Listed on the Canadian NDSL (Non-Domestic Substances List)

**Allyl alcohol (107-18-6)**

Listed on the Canadian DSL (Domestic Substances List)

| WHMIS Classification | Class B Division 2 - Flammable Liquid  
|                       | Class D Division 1 Subdivision A - Very toxic material causing immediate and serious toxic effects  
|                       | Class D Division 2 Subdivision B - Toxic material causing other toxic effects |

**EU-Regulations**

**Triallyl borate (1693-71-6)**

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

**Allyl alcohol (107-18-6)**

Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

**National regulations**

**Triallyl borate (1693-71-6)**

Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)  
Listed on the Canadian IDL (Ingredient Disclosure List)  
Listed on INSQ (Mexican National Inventory of Chemical Substances)

**Allyl alcohol (107-18-6)**

Listed on the AICS (Australian Inventory of Chemical Substances)  
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)  
Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory  
Listed on the Korean ECL (Existing Chemicals List)  
Listed on NZIoC (New Zealand Inventory of Chemicals)  
Japanese Poisonous and Deleterious Substances Control Law  
Japanese Pollutant Release and Transfer Register Law (PRTR Law)  
Listed on the Canadian IDL (Ingredient Disclosure List)  
Listed on INSQ (Mexican National Inventory of Chemical Substances)

15.3. US State regulations

California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm

**Triallyl borate (1693-71-6)**

U.S. - New Jersey - Right to Know Hazardous Substance List

**Allyl alcohol (107-18-6)**

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List
U.S. - Pennsylvania - RTK (Right to Know) List

**SECTION 16: Other information**

Full text of H-phrases:

<table>
<thead>
<tr>
<th>H-Phrase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>H225</td>
<td>Highly flammable liquid and vapor</td>
</tr>
<tr>
<td>H226</td>
<td>Flammable liquid and vapor</td>
</tr>
<tr>
<td>H301</td>
<td>Toxic if swallowed</td>
</tr>
<tr>
<td>H310</td>
<td>Fatal in contact with skin</td>
</tr>
<tr>
<td>H315</td>
<td>Causes skin irritation</td>
</tr>
<tr>
<td>H319</td>
<td>Causes serious eye irritation</td>
</tr>
<tr>
<td>H330</td>
<td>Fatal if inhaled</td>
</tr>
<tr>
<td>H332</td>
<td>Harmful if inhaled</td>
</tr>
<tr>
<td>H335</td>
<td>May cause respiratory irritation</td>
</tr>
<tr>
<td>H400</td>
<td>Very toxic to aquatic life</td>
</tr>
<tr>
<td>H402</td>
<td>Harmful to aquatic life</td>
</tr>
</tbody>
</table>
BORON ALLYLOXIDE
Safety Data Sheet

Abbreviations and acronyms: ND: Not Determined, No Data; NA: Not Applicable; LD: Lethal Dose; LC: Lethal Concentration; ATE: Acute Toxicity Estimates; H: hour; °: °C unless otherwise stated; mm: millimeters Hg, torr; PEL: permissible exposure level; TWA: time weighted average; TLV: threshold limit value; TG: Test Guideline; NIOSH: National Institute for Occupational Safety and Health; IARC: International Agency for Research on Cancer; NTP: National Toxicology Program; HMIS: Hazardous Material Information System; CAS No.: Chemical Abstract Service Registration Number; EC No.: European Commission Registration Number; EC Index No.: European Commission Index Number; OECD: The Organisation for Economic Co-operation and Development; GHS: The Globally Harmonized System of Classification and Labelling; APF: Assigned Protection Factor.

Hazard Rating

Health: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability: 3 Serious Hazard - Materials capable of ignition under almost all normal temperature conditions. Includes flammable liquids with flash points below 73 F and boiling points above 100 F. as well as liquids with flash points between 73 F and 100 F. (Classes IB & IC)

Physical: 1 Slight Hazard - Materials that are normally stable but can become unstable (self-react) at high temperatures and pressures. Materials may react non-violently with water or undergo hazardous polymerization in the absence of inhibitors.

Prepared by safety and environmental affairs.

Date of issue: 08/17/2015  Revision date: 09/01/2015  Version: 2.0

SDS US (GHS HazCom 2012) - Custom

According to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

The information contained in this document has been gathered from reference materials and/or Gelest, Inc. test data and is to the best knowledge and belief of Gelest, Inc. accurate and reliable. Such information is offered solely for your consideration, investigation and verification. It is not suggested or guaranteed that the hazard precautions or procedures described are the only ones which exist. Gelest, Inc. makes no warranties, express or implied, with respect to the use of such information and assumes no responsibility therefore. Information on this safety data sheet is not intended to constitute a basis for product specifications.

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