SECTION 1: Identification of the substance/mixture and of the company/undertaking

1.1. Product identifier

Product form: Substance
Physical state: Liquid
Substance name: NIOBIUM(V) ETHOXIDE
Product code: AKN590
Formula: C10H25NbO5
Synonyms: PENTAETHOXYNIOBIUM; NIOBIUM(5+) ETHANOLATE
Chemical family: METAL ESTER

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

Use of the substance/mixture: Chemical intermediate
For research and industrial use only

1.3. Details of the supplier of the safety data sheet

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: Hazards identification

2.1. Classification of the substance or mixture

Classification (GHS-US)
Flam. Liq. 4 H227
Eye Irrit. 2A H319

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labelling
Hazard pictograms (GHS-US) : GHS07

Signal word (GHS-US) : Warning
Hazard statements (GHS-US) : H227 - Combustible liquid
H319 - Causes serious eye irritation
Precautionary statements (GHS-US) : P280 - Wear protective gloves/protective clothing/eye protection/face protection
P210 - Keep away from heat, open flames, sparks. - No smoking
P264 - Wash hands thoroughly after handling
P305+P351+P338 - IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
P337+P313 - If eye irritation persists: Get medical advice/attention
P370+P378 - In case of fire: Use water spray or fog, foam, carbon dioxide, dry chemical to extinguish
P403+P235 - Keep in a cool place
P501 - Dispose of contents/container to licensed waste disposal facility.

2.3. Other hazards

Other hazards not contributing to the classification: The hydrolysis product of this compound is ethanol. Overexposure to ethanol by skin absorption, inhalation or ingestion may have a narcotic effect (headache, nausea, drowsiness). Ethanol is metabolized to acetaldehyde and acetic acid which in large quantities result in metabolic acidosis, CNS depression and death due to respiratory arrest. This product contains ethanol which is classified as a carcinogen by IARC in alcoholic beverages.

2.4. Unknown acute toxicity (GHS-US)

No data available
SECTION 3: Composition/information on ingredients

3.1. Substance

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>Classification (GHS-US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Niobium(V) ethanolate</td>
<td>(CAS No) 3236-82-6</td>
<td>&gt; 90</td>
<td>Flam. Liq. 4, H227 Eye Irrit. 2A, H319</td>
</tr>
<tr>
<td>Ethanol</td>
<td>(CAS No) 64-17-5</td>
<td></td>
<td>Flam. Liq. 2, H225 Carc. 1A, H350 STOT SE 3, H335 Aquatic Acute 2, H401</td>
</tr>
</tbody>
</table>

3.2. Mixture

Not applicable

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.

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, both acute and delayed

Symptoms/injuries after inhalation: May cause irritation to the respiratory tract.

Symptoms/injuries after skin contact: May cause skin irritation.

Symptoms/injuries after eye contact: Causes serious eye irritation.

Symptoms/injuries after ingestion: May be harmful if swallowed.

Chronic symptoms: On contact with water this compound liberates ethanol which is known to have a chronic effect on the central nervous system.

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

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media


Unsuitable extinguishing media: Do not use straight streams.

5.2. Special hazards arising from the substance or mixture

Fire hazard: Combustible liquid. Irritating fumes and organic acid vapors may develop when material is exposed to elevated temperatures or open flame.

5.3. Advice for firefighters

Firefighting instructions: Use water spray or fog for cooling exposed containers. 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. 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.

7.3. Specific end use(s)

No additional information available.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

**Ethanol (64-17-5)**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA ACGIH STEL (ppm)</td>
<td>1000 ppm</td>
</tr>
<tr>
<td>USA NIOSH NIOSH REL (TWA) (mg/m³)</td>
<td>1900 mg/m³</td>
</tr>
<tr>
<td>USA NIOSH NIOSH REL (TWA) (ppm)</td>
<td>1000 ppm</td>
</tr>
<tr>
<td>USA OSHA OSHA PEL (TWA) (mg/m³)</td>
<td>1900 mg/m³</td>
</tr>
<tr>
<td>USA OSHA OSHA PEL (TWA) (ppm)</td>
<td>1000 ppm</td>
</tr>
<tr>
<td>USA IDLH US IDLH (ppm)</td>
<td>3300 ppm (10% LEL)</td>
</tr>
</tbody>
</table>

8.2. Exposure controls

Appropriate engineering controls: Provide local exhaust or general room ventilation.

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. NIOSH-certified organic vapor (black cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

**Physical state**: Liquid

**Appearance**: Clear liquid. Viscous.

**Molecular mass**: 318.22 g/mol

**Color**: Pale yellow.

**Odor**: No data available

**Odor threshold**: No data available

**Refractive index**: 1.516
**NIIOBIUM(V) ETHOXIDE**
Safety Data Sheet

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<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>5 - 6 °C</td>
</tr>
<tr>
<td>Boiling point</td>
<td>142 °C @ 0.1 mm Hg</td>
</tr>
<tr>
<td>Flash point</td>
<td>74 °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>Combustible liquid</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>1.268</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>No data available</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 moist air or with water liberating ethanol.

#### 10.4. Conditions to avoid

Heat. Open flame. Sparks.

#### 10.5. Incompatible materials


#### 10.6. Hazardous decomposition products


### SECTION 11: Toxicological information

#### 11.1. Information on toxicological effects

**Acute toxicity**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol</td>
<td>Not classified</td>
</tr>
</tbody>
</table>

**Ethanol (64-17-5)**

<table>
<thead>
<tr>
<th>Test</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>7060 mg/kg</td>
</tr>
<tr>
<td>LC50 inhalation rat (mg/l)</td>
<td>124.7 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (oral)</td>
<td>7060.000 mg/kg body weight</td>
</tr>
<tr>
<td>ATE US (vapors)</td>
<td>124.700 mg/l/4h</td>
</tr>
<tr>
<td>ATE US (dust, mist)</td>
<td>124.700 mg/l/4h</td>
</tr>
</tbody>
</table>

**Skin corrosion/irritation**

Not classified

**Serious eye damage/irritation**

Causes serious eye irritation.

**Respiratory or skin sensitization**

Not classified

**Germ cell mutagenicity**

Not classified

**Carcinogenicity**

Not classified

**Ethanol (64-17-5)**

<table>
<thead>
<tr>
<th>IARC group</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Carcinogenic to humans</td>
</tr>
</tbody>
</table>

**Reproductive toxicity**

Not classified

**Specific target organ toxicity (single exposure)**

Not classified
Specific target organ toxicity (repeated exposure):
- Not classified

Aspiration hazard:
- Not classified

Symptoms/injuries after inhalation:
- May cause irritation to the respiratory tract.

Symptoms/injuries after skin contact:
- May cause skin irritation.

Symptoms/injuries after eye contact:
- Causes serious eye irritation.

Symptoms/injuries after ingestion:
- May be harmful if swallowed.

Chronic symptoms:
- On contact with water this compound liberates ethanol which is known to have a chronic effect on the central nervous system.

Reason for classification:
- Expert judgment

SECTION 12: Ecological information

12.1. Toxicity

<table>
<thead>
<tr>
<th>Substance</th>
<th>Toxicity Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ethanol (64-17-5)</td>
<td>LC50 fish 1</td>
<td>12.0 - 16.0 ml/l (96 h)</td>
</tr>
<tr>
<td></td>
<td>EC50 Daphnia 1</td>
<td>9268 - 14221 mg/l (48 h)</td>
</tr>
<tr>
<td></td>
<td>LC50 fish 2</td>
<td>&gt; 100 mg/l (96 h)</td>
</tr>
<tr>
<td></td>
<td>EC50 Daphnia 2</td>
<td>2 mg/l (48 h)</td>
</tr>
</tbody>
</table>

12.2. Persistence and degradability
- No additional information available

12.3. Bioaccumulative potential
- Log Pow:
  - Ethanol (64-17-5): -0.32

12.4. Mobility in soil
- No additional information available

12.5. Other adverse effects
- Effect on ozone layer:
  - No additional information available
- Effect on the global warming:
  - No known ecological damage caused by this product.

SECTION 13: Disposal considerations

13.1. Waste treatment methods
- Sewage disposal recommendations:
  - Do not dispose of waste into sewer.
- Waste disposal recommendations:
  - Incinerate. Dispose 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
- DOT NA no.: NA1993
- Proper Shipping Name (DOT):
  - Combustible liquid, n.o.s.
  - NIOBIUM(V) ETHOXIDE
- Department of Transportation (DOT) Hazard Classes:
  - 3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
- DOT Symbols:
  - D - Proper shipping name for domestic use only, or to and from Canada,G - Identifies PSN requiring a technical name
- Packing group (DOT):
  - III - Minor Danger
- DOT Packaging Exceptions (49 CFR 173.xxx):
  - 150
- DOT Packaging Non Bulk (49 CFR 173.xxx):
  - 203
- DOT Packaging Bulk (49 CFR 173.xxx):
  - 241

14.3. Additional information
- 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 : 60 L
(49 CFR 173.27)
DOT Quantity Limitations Cargo aircraft only (49 : 220 L
CFR 175.75)

SECTION 15: Regulatory information

15.1. US Federal regulations

Ethanol (64-17-5)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

Niobium(V) ethanolate (3236-82-6)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

Ethanol (64-17-5)
Listed on IARC (International Agency for Research on Cancer)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on the Canadian DSL (Domestic Substances List)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
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)
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)
Listed on Turkish inventory of chemical

Niobium(V) ethanolate (3236-82-6)
Listed on the Canadian NDSL (Non-Domestic Substances List)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

15.3. US State regulations

| NIOBIUM(V) ETHOXIDE(3236-82-6) | U.S. - California - Proposition 65 - Carcinogens List | No |
| U.S. - California - Proposition 65 - Developmental Toxicity | No |
| U.S. - California - Proposition 65 - Reproductive Toxicity - Female | No |
| U.S. - California - Proposition 65 - Reproductive Toxicity - Male | No |

| Ethanol (64-17-5) | U.S. - California - Proposition 65 - Carcinogens List | U.S. - California - Proposition 65 - Developmental Toxicity | U.S. - California - Proposition 65 - Reproductive Toxicity - Female | U.S. - California - Proposition 65 - Reproductive Toxicity - Male | No significance risk level (NSRL) |
| Yes | Yes | No | No |

| Niobium(V) ethanolate (3236-82-6) | U.S. - California - Proposition 65 - Carcinogens List | U.S. - California - Proposition 65 - Developmental Toxicity | U.S. - California - Proposition 65 - Reproductive Toxicity - Female | U.S. - California - Proposition 65 - Reproductive Toxicity - Male | No significance risk level (NSRL) |
| No | No | No | No |

SECTION 16: Other information

Abbreviations and acronyms
Abbreviations: 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.
NIOBIUM(V) ETHOXIDE
Safety Data Sheet

Full text of H-phrases:

<table>
<thead>
<tr>
<th>H-Phrase</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aquatic Acute 2</td>
<td>Hazardous to the aquatic environment - Acute Hazard Category 2</td>
</tr>
<tr>
<td>Carc. 1A</td>
<td>Carcinogenicity Category 1A</td>
</tr>
<tr>
<td>Eye Irrit. 2A</td>
<td>Serious eye damage/eye irritation Category 2A</td>
</tr>
<tr>
<td>Flam. Liq. 2</td>
<td>Flammable liquids Category 2</td>
</tr>
<tr>
<td>Flam. Liq. 4</td>
<td>Flammable liquids Category 4</td>
</tr>
<tr>
<td>STOT SE 3</td>
<td>Specific target organ toxicity (single exposure) Category 3</td>
</tr>
<tr>
<td>H225</td>
<td>Highly flammable liquid and vapor</td>
</tr>
<tr>
<td>H227</td>
<td>Combustible liquid</td>
</tr>
<tr>
<td>H319</td>
<td>Causes serious eye irritation</td>
</tr>
<tr>
<td>H335</td>
<td>May cause respiratory irritation</td>
</tr>
<tr>
<td>H350</td>
<td>May cause cancer</td>
</tr>
<tr>
<td>H401</td>
<td>Toxic to aquatic life</td>
</tr>
</tbody>
</table>

HMIS III Rating

Health: 2 Moderate Hazard - Temporary or minor injury may occur
Flammability: 2 Moderate Hazard
Physical: 1 Slight Hazard

Prepared by safety and environmental affairs.

Date of issue: 08/14/2015  Version: 1.0

SDS US (GHS HazCom 2012) - Custom

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

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