SECTION 1: Identification

1.1. Identification
Product name: TITANIUM n-PROPOXIDE
Product code: AKT885
Product form: Substance
Physical state: Liquid
Formula: C12H28O4Ti2
Synonyms: n-PROPYLTITANATE, TITANIUM TETRA(n-PROPOXIDE)
Chemical family: METAL 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: H226 - Flammable liquid and vapor
- Serious eye damage/eye irritation Category 2A: H319 - Causes serious eye irritation

Full text of H statements: see section 16

2.2. GHS Label elements, including precautionary statements
GHS US labeling
Hazard pictograms (GHS US):

Signal word (GHS US): Warning
Hazard statements (GHS US): H226 - Flammable liquid and vapor
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.
- P233 - Keep container tightly closed.
- 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.
- P264 - Wash hands thoroughly after handling.
- P303+P361+P353 - If on skin (or hair): take off immediately all contaminated clothing. Rinse skin with water/shower
- 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. Hazards not otherwise classified (HNOC)
Other hazards not contributing to the classification:
- Material may form zirconium oxides or zirconate polymers on the skin, eyes or in the lungs. Prolonged exposure to zirconium compounds can induce formation of granulomatous lesions in the lungs or on the skin.
TITANIUM n-PROPOXIDE
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2.4. Unknown acute toxicity (GHS US)
Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substances

<table>
<thead>
<tr>
<th>Substance type</th>
<th>Name</th>
<th>CAS-No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mono-constituent</td>
<td>TITANIUM n-PROPOXIDE</td>
<td>3087-37-4</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Name</th>
<th>Product identifier</th>
<th>%</th>
<th>GHS-US classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Titanium n-propoxide</td>
<td>(CAS-No.) 3087-37-4</td>
<td>&gt; 96</td>
<td>Flam. Liq. 3, H226</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eye Irrit. 2A, H319</td>
</tr>
<tr>
<td>n-Propanol</td>
<td>(CAS-No.) 71-23-8</td>
<td></td>
<td>Flam. Liq. 3, H226,</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Acute Tox. 4 (Oral), H302</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Skin Irrit. 2, H315</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>Eye Irrit. 2A, H319</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>STOT SE 3, H336</td>
</tr>
</tbody>
</table>

Full text of hazard classes and H-statements: see section 16

3.2. Mixtures
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.

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 (acute and delayed)

Symptoms/effects after inhalation: May cause irritation to the respiratory tract. Headache. Nausea.

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

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

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

4.3. Immediate medical attention and special treatment, if necessary

Note to physician: Activated charcoal slurry may be administered. Activated charcoal slurry is prepared by suspending 50 grams of activated charcoal in 400 ml water and mixing thoroughly. Administer 5 ml/kg.

SECTION 5: Fire-fighting measures

5.1. Suitable (and unsuitable) extinguishing media


5.2. Specific hazards arising from the chemical

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

5.3. Special protective equipment and precautions for fire-fighters

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

Emergency procedures: Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment: Equip cleanup crew with proper protection.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.
TITANIUM n-PROPOXIDE
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6.3. Methods and material for containment and cleaning up
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
Additional hazards when processed: Handle empty containers with care because residual vapors are flammable.
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. Proper grounding procedures to avoid static electricity should be followed. Use explosion-proof electrical equipment.
Storage conditions: Keep container tightly closed.
Incompatible materials: Oxidizing agent.
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>n-Propanol (71-23-8)</th>
<th>ACGIH TWA (ppm)</th>
<th>OSHA PEL (TWA) (mg/m³)</th>
<th>OSHA PEL (TWA) (ppm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACGIH</td>
<td></td>
<td>100 ppm</td>
<td></td>
</tr>
<tr>
<td>OSHA</td>
<td></td>
<td>500 mg/m³</td>
<td></td>
</tr>
<tr>
<td>OSHA</td>
<td></td>
<td>200 ppm</td>
<td></td>
</tr>
<tr>
<td>IDLH</td>
<td></td>
<td>800 ppm</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td></td>
<td>500 mg/m³</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td></td>
<td>200 ppm</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td></td>
<td>625 mg/m³</td>
<td></td>
</tr>
<tr>
<td>NIOSH</td>
<td></td>
<td>250 ppm</td>
<td></td>
</tr>
</tbody>
</table>

8.2. Appropriate engineering controls
Appropriate engineering controls: Provide local exhaust or general room 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:
NIOSH-certified organic vapor (black cartridge) respirator.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Liquid</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Clear liquid.</td>
</tr>
<tr>
<td>Molecular mass</td>
<td>284.25 g/mol</td>
</tr>
</tbody>
</table>
TITANIUM n-PROPOXIDE
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Color: Pale yellow.
Odor: No data available
Odor threshold: No data available
Refractive index: 1.4966
pH: No data available
Relative evaporation rate (butyl acetate=1): No data available
Melting point: No data available
Freezing point: < 0 °C
Boiling point: 137 °C @ 5 mm Hg
Flash point: 45 °C
Auto-ignition temperature: No data available
Decomposition temperature: No data available
Flammability (solid, gas): Flammable liquid and vapor
Vapor pressure: 1 mm Hg @ 120˚C
Relative vapor density at 20 °C: > 1
Relative density: 0.955
% Volatiles: < 4 %
Solubility: Reacts with water.
Log Pow: No data available
Log Kow: No data available
Viscosity, kinematic: 150 - 165 cSt @ 25˚C
Viscosity, dynamic: No data available
Explosive properties: No data available
Oxidizing properties: No data available
Explosion limits: No data available

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 and rapidly in contact with water liberating n-propanol.

10.4. Conditions to avoid
Heat. Open flame. Sparks.

10.5. Incompatible materials
Oxidizing agent.

10.6. Hazardous decomposition products

SECTION 11: Toxicological information

11.1. Information on toxicological effects
Acute toxicity: Not classified

n-Propanol (71-23-8)

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>LD50 oral rat</td>
<td>1870 mg/kg</td>
</tr>
<tr>
<td>LD50 dermal rabbit</td>
<td>4049 mg/kg</td>
</tr>
<tr>
<td>LC50 inhalation rat (ppm)</td>
<td>&gt; 13548 ppm/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
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/effects after inhalation
- May cause irritation to the respiratory tract. Headache. Nausea.

### Symptoms/effects after skin contact
- May cause skin irritation.

### Symptoms/effects after eye contact
- Causes serious eye irritation.

### Symptoms/effects after ingestion
- May be harmful if swallowed.

### Reason for classification
- Expert judgment

## SECTION 12: Ecological information

### 12.1. Toxicity

<table>
<thead>
<tr>
<th>n-Propanol (71-23-8)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>LC50 fish 1</td>
<td>4480 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])</td>
</tr>
<tr>
<td>EC50 Daphnia 1</td>
<td>3642 mg/l (Exposure time: 48 h - Species: Daphnia magna)</td>
</tr>
<tr>
<td>EC50 Daphnia 2</td>
<td>3339 - 3977 mg/l (Exposure time: 48 h - Species: Daphnia magna [Static])</td>
</tr>
</tbody>
</table>

### 12.2. Persistence and degradability

No additional information available

### 12.3. Bioaccumulative potential

<table>
<thead>
<tr>
<th>n-Propanol (71-23-8)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Log Pow</td>
<td>0.25 - 0.34</td>
</tr>
</tbody>
</table>

### 12.4. Mobility in soil

No additional information available

### 12.5. Other adverse effects

| Effect on the ozone layer | No additional information available |

## SECTION 13: Disposal considerations

### 13.1. Disposal methods

- 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

<table>
<thead>
<tr>
<th>UN-No. (DOT)</th>
<th>2413</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT NA no.</td>
<td>UN2413</td>
</tr>
</tbody>
</table>

### 14.2. UN proper shipping name

<table>
<thead>
<tr>
<th>Transport document description</th>
<th>UN2413 Tetrapropylorthotitanate, 3, III</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proper Shipping Name (DOT)</td>
<td>Tetrapropylorthotitanate</td>
</tr>
<tr>
<td>Class (DOT)</td>
<td>3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120</td>
</tr>
<tr>
<td>Packing group (DOT)</td>
<td>III - Minor Danger</td>
</tr>
<tr>
<td>Hazard labels (DOT)</td>
<td>3 - Flammable liquid</td>
</tr>
</tbody>
</table>

### 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

### 14.3. Additional information

| Emergency Response Guide (ERG) Number | 128 |

| Other information | No supplementary information available. |
TITANIUM n-PROPOXIDE

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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: 220 L
(49 CFR 175.75)

SECTION 15: Regulatory information

15.1. US Federal regulations
n-Propanol (71-23-8)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Titanium n-propoxide (3087-37-4)
Listed on the United States TSCA (Toxic Substances Control Act) inventory

15.2. International regulations

CANADA
n-Propanol (71-23-8)
Listed on the Canadian DSL (Domestic Substances List)
WHMIS Classification: Class B Division 2 - Flammable Liquid
Class D Division 2 Subdivision B - Toxic material causing other toxic effects

Titanium n-propoxide (3087-37-4)
Listed on the Canadian NDSL (Non-Domestic Substances List)

EU-Regulations
n-Propanol (71-23-8)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

Titanium n-propoxide (3087-37-4)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)

National regulations
n-Propanol (71-23-8)
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)
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 CICR (Turkish Inventory and Control of Chemicals)

Titanium n-propoxide (3087-37-4)
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)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
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

n-Propanol (71-23-8)
U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

Titanium n-propoxide (3087-37-4)
U.S. - New Jersey - Right to Know Hazardous Substance List

Print date: 04/11/2019 EN (English US) SDS ID: AKT885 6/7
SECTION 16: Other information

Full text of H-phrases:

<table>
<thead>
<tr>
<th>H226</th>
<th>Flammable liquid and vapor</th>
</tr>
</thead>
<tbody>
<tr>
<td>H302</td>
<td>Harmful if swallowed</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>H336</td>
<td>May cause drowsiness or dizziness</td>
</tr>
</tbody>
</table>

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; GHS: The Globally Harmonized System of Classification and Labelling; APF: Assigned Protection Factor.

Hazard Rating

- Health: 2 Moderate Hazard - Temporary or minor injury may occur
- 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: 04/03/2015 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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