Appendix A - Chemicals

- Chemical List
- Chemical Assessment
- Safety Data Sheets
List of Chemical Hazards

PI: Robert M. Farrell
Room: TBD

*All quantities listed below are maximum amounts expected for each chemical

Compressed Gases (Class 2)
- Ammonia – 50 L cylinder (flammable, corrosive, poisonous/toxic) MSDS
- Disilane 40 ppm balance N₂ – 10 L cylinder (flammable) MSDS
- Disilane 1% balance N₂ – 10 L cylinder (flammable) MSDS

Flammable & Combustible Liquids (Class 3)
- Trimethylgallium (TMGa) – 500 mL metalorganic bubbler (class IA flammable) MSDS
- Triethylgallium (TEGa) – 500 mL metalorganic bubbler (class IA flammable) MSDS
- Trimethylaluminum (TMAl) – 500 mL metalorganic bubbler (class IA flammable) MSDS
- Acetone – 4 L bottle (class IB flammable)
- Isopropanol – 4 L bottle (class IC flammable)

Reactives (Class 4)
- Trimethylindium (TMIn) – 150 g metalorganic bubbler (spontaneously combustible materials) MSDS
- Bis(cyclopentadienyl)magnesium (Cp₂Mg) – 150 g metalorganic bubbler (spontaneously combustible materials) MSDS
- Bis(cyclopentadienyl)iron (Cp₂Fe) – 500 g metalorganic bubbler (flammable solids?) MSDS

Corrosives (Class 8)
- HCl (37% balance H₂O) – 2.5 L bottle (acids)
- HNO₃ (70% balance H₂O) – 2.5 L bottle (acids)
- H₂O₂ (30% balance H₂O) – 2.5 L bottle (acids)
- H₃PO₄ (85% balance H₂O) – 2.5 L bottle (acids)
- H₂SO₄ (96% balance H₂O) – 2.5 L bottle (acids)

Other Hazards
- H₂ gas line – maximum flow of 40 slm at 90 psi (most likely to be supplied to the lab via an external hydrogen generator, details TBD)
- N₂ gas line – maximum flow of 50 slm at 90 psi (most likely to be supplied to the lab via an external liquid nitrogen tank, details TBD)

Notes
- Solvents and acids are to be stored in closed containers except when being used.
- All other chemicals are to be connected to the MOCVD reactor at all times. Spare chemicals in the same quantities or smaller may also be stored in the lab if regulations allow.
- An initial search indicates that Cp₂Fe does not appear to be a spontaneously combustible material.
- If Cp₂Fe is classified as a spontaneously combustible material, then the total amounts of TMIn, Cp₂Mg, and Cp₂Fe could each be limited to 100 g or less (for a combined total of 300 g or less).
<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>Proposed Chemical Amounts (Storage)</th>
<th>Proposed Chemical Amounts (In Use - Closed Systems)</th>
<th>Hazard Class</th>
<th>Physical State</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Proposed Quantity</td>
<td>Units</td>
<td>Proposed Quantity</td>
<td>Units</td>
</tr>
<tr>
<td>Compressed Gases (Class 2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ammonia</td>
<td>50 L Comp Gas</td>
<td>cuft 50</td>
<td>L Comp Gas</td>
<td>cuft 50</td>
</tr>
<tr>
<td>Disilane - 0 ppm balance N₂</td>
<td>10 L Comp Gas</td>
<td>cuft 10</td>
<td>L Comp Gas</td>
<td>cuft 10</td>
</tr>
<tr>
<td>Disilane - 1% Balance N₂</td>
<td>10 L Comp Gas</td>
<td>cuft 10</td>
<td>L Comp Gas</td>
<td>cuft 10</td>
</tr>
<tr>
<td>Flammable &amp; Combustible Liquids (Class 3)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimethylgallium (TMGa)</td>
<td>500 ml Liquid to l</td>
<td>1.3210 lb</td>
<td>500 ml Liquid to l</td>
<td>1.3210 lb</td>
</tr>
<tr>
<td>Triethylgallium (TEGa)</td>
<td>500 ml Liquid to l</td>
<td>1.3210 lb</td>
<td>500 ml Liquid to l</td>
<td>1.3210 lb</td>
</tr>
<tr>
<td>Trimethylaluminum (TMA1)</td>
<td>500 ml Liquid to l</td>
<td>1.3210 lb</td>
<td>500 ml Liquid to l</td>
<td>1.3210 lb</td>
</tr>
<tr>
<td>Acetone</td>
<td>4 l Liquid</td>
<td>1.0568 gal</td>
<td>4 l Liquid</td>
<td>1.0568 gal</td>
</tr>
<tr>
<td>Isopropanol</td>
<td>4 l Liquid</td>
<td>1.0568 gal</td>
<td>4 l Liquid</td>
<td>1.0568 gal</td>
</tr>
<tr>
<td>Reactive (Class 4)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimethylindium (TMIn)</td>
<td>150 g</td>
<td>0.3304 lb</td>
<td>150 g</td>
<td>0.3304 lb</td>
</tr>
<tr>
<td>Bis(cyclopentadienyl)Iron</td>
<td>Magnesium (Cp2Mg)</td>
<td>150 g</td>
<td>0.3304 lb</td>
<td>150 g</td>
</tr>
<tr>
<td>Bis(cyclopentadienyl)Iron</td>
<td>Ferrocene</td>
<td>500 g</td>
<td>1.1013 lb</td>
<td>500 g</td>
</tr>
<tr>
<td>Corrosives (Class 8)</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>HCL (37% balance H₂O)</td>
<td>2.5 l Liquid</td>
<td>0.6605 gal</td>
<td>2.5 l Liquid</td>
<td>0.6605 gal</td>
</tr>
<tr>
<td>HNO₃ (70% balance H₂O)</td>
<td>2.5 l Liquid to lbs</td>
<td>6.6050 lb</td>
<td>2.5 l Liquid to lbs</td>
<td>6.6050 lb</td>
</tr>
<tr>
<td>H₂O₂ (30% balance H₂O)</td>
<td>2.5 l Liquid to lbs</td>
<td>6.6050 lb</td>
<td>2.5 l Liquid to lbs</td>
<td>6.6050 lb</td>
</tr>
<tr>
<td>H₂SO₄ (85% balance H₂O)</td>
<td>2.5 l Liquid to lbs</td>
<td>6.6050 lb</td>
<td>2.5 l Liquid to lbs</td>
<td>6.6050 lb</td>
</tr>
<tr>
<td>Other Hazards</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>H₂ Gas line</td>
<td>0 l at 60 ps</td>
<td>0.0000 cuft</td>
<td>40 l at 60 ps</td>
<td>0.7600 cuft</td>
</tr>
<tr>
<td>N₂ Gas line</td>
<td>0 l at 60 ps</td>
<td>0.0000 cuft</td>
<td>50 l at 60 ps</td>
<td>7.2063 cuft</td>
</tr>
</tbody>
</table>
### Maximum Allowable Quantities

#### Chemical Classification

<table>
<thead>
<tr>
<th>Chemical Classification</th>
<th>Total Chemical Amounts</th>
<th>Maximum Allowable Quantity - Per control area - Per IBC tables 307.1(1) and 307.1(2) and Per tables IFC 2703.1.1(1) and 2703.1.1(2)</th>
<th>Limit Adjustments Notes (Applied in IBC Totals)</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Proposed Quantity (SI)</td>
<td>Proposed Quantity (Eng)</td>
<td>Hazard Class</td>
</tr>
<tr>
<td><strong>Flammable Gas - Total</strong></td>
<td>0.0000 cuFt</td>
<td>0.7650 cuFt</td>
<td>Flammable Gas</td>
</tr>
<tr>
<td><strong>LB Flammable Liquid - Total</strong></td>
<td>2.1136 Gal</td>
<td>2.1136 Gal</td>
<td>LB Flammable Liquid</td>
</tr>
<tr>
<td><strong>Flammable Solid - Total</strong></td>
<td>1.013 lb</td>
<td>1.013 lb</td>
<td>Flammable Solid</td>
</tr>
<tr>
<td><strong>Oxidizer Class 1 Liquid - Total</strong></td>
<td>6.6050 lb</td>
<td>6.6050 lb</td>
<td>Oxidizer Class 1</td>
</tr>
<tr>
<td><strong>Oxidizer Class 2 Liquid - Total</strong></td>
<td>13.2100 lb</td>
<td>13.2100 lb</td>
<td>Oxidizer Class 2</td>
</tr>
<tr>
<td><strong>Pyrophoric Gas - Total</strong></td>
<td>48.5909 cuFt</td>
<td>48.5909 cuFt</td>
<td>Pyrophoric</td>
</tr>
<tr>
<td><strong>Pyrophoric Liquid - Total</strong></td>
<td>3.9630 lb</td>
<td>3.9630 lb</td>
<td>Pyrophoric</td>
</tr>
<tr>
<td><strong>Pyrophoric Solid - Total</strong></td>
<td>0.6608 lb</td>
<td>0.6608 lb</td>
<td>Pyrophoric</td>
</tr>
<tr>
<td><strong>Water Reactive Class 2 Liquid - Total</strong></td>
<td>6.6050 lb</td>
<td>6.6050 lb</td>
<td>Water Reactive Class 2</td>
</tr>
<tr>
<td><strong>Corrosive Gas - Total</strong></td>
<td>242.9543 cuFt</td>
<td>242.9543 cuFt</td>
<td>Corrosive</td>
</tr>
<tr>
<td><strong>Corrosive Liquid - Total</strong></td>
<td>6605 Gal</td>
<td>6605 Gal</td>
<td>Corrosive</td>
</tr>
</tbody>
</table>
Material Safety Data Sheet
Acetone MSDS

Section 1: Chemical Product and Company Identification

Product Name: Acetone
Catalog Codes: SLA3502, SLA1645, SLA3151, SLA3808
CAS#: 67-64-1
RTECS: AL3150000
TSCA: TSCA 8(b) inventory: Acetone
CI#: Not applicable.
Synonym: 2-propanone; Dimethyl Ketone; Dimethylformaldehyde; Pyroacetic Acid
Chemical Name: Acetone
Chemical Formula: C3-H6-O

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: 1-800-901-7247
International Sales: 1-281-441-4400
Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acetone</td>
<td>67-64-1</td>
<td>100</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: Acetone: ORAL (LD50): Acute: 5800 mg/kg [Rat]. 3000 mg/kg [Mouse]. 5340 mg/kg [Rabbit]. VAPOR (LC50): Acute: 50100 mg/m 8 hours [Rat]. 44000 mg/m 4 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. The substance is toxic to central nervous system (CNS). The substance may be toxic to kidneys, the reproductive system, liver, skin. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures
**Eye Contact:**
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Get medical attention.

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

**Ingestion:**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

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**Section 5: Fire and Explosion Data**

**Flammability of the Product:** Flammable.

**Auto-Ignition Temperature:** 465°C (869°F)

**Flash Points:**
- CLOSED CUP: -20°C (-4°F).
- OPEN CUP: -9°C (15.8°F) (Cleveland).

**Flammable Limits:**
- LOWER: 2.6%
- UPPER: 12.8%

**Products of Combustion:** These products are carbon oxides (CO, CO2).

**Fire Hazards in Presence of Various Substances:** Highly flammable in presence of open flames and sparks, of heat.

**Explosion Hazards in Presence of Various Substances:**
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of oxidizing materials, of acids.

**Fire Fighting Media and Instructions:**
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

**Special Remarks on Fire Hazards:** Vapor may travel considerable distance to source of ignition and flash back.

**Special Remarks on Explosion Hazards:**
Forms explosive mixtures with hydrogen peroxide, acetic acid, nitric acid, nitric acid + sulfuric acid, chromic anhydride, chromyl chloride, nitrosyl chloride, hexachloromelamine, nitrosyl perchlorate, nitryl perchlorate, permonosulfuric acid, thiodiglycol + hydrogen peroxide, potassium ter-butoxide, sulfur dichloride, 1-methyl-1,3-butadiene, bromoform, carbon, air, chloroform, thiriazyl perchlorate.

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**Section 6: Accidental Release Measures**

**Small Spill:**
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.
Large Spill:  
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:  
Keep locked up. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, acids, alkalis.

Storage:  
Store in a segregated and approved area (flammables area). Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Keep away from direct sunlight and heat and avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:  
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:  
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:  
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:  
TWA: 500 STEL: 750 (ppm) from ACGIH (TLV) [United States] TWA: 750 STEL: 1000 (ppm) from OSHA (PEL) [United States] TWA: 500 STEL: 1000 [Australia] TWA: 1185 STEL: 2375 (mg/m3) [Australia] TWA: 750 STEL: 1500 (ppm) [United Kingdom (UK)] TWA: 1810 STEL: 3620 (mg/m3) [United Kingdom (UK)] TWA: 1800 STEL: 2400 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.
Taste: Pungent, Sweetish
Molecular Weight: 58.08 g/mole
Color: Colorless. Clear
pH (1% soln/water): Not available.
Boiling Point: 56.2°C (133.2°F)
Melting Point: -95.35 (-139.6°F)
Critical Temperature: 235°C (455°F)
Specific Gravity: 0.79 (Water = 1)
**Vapor Pressure:** 24 kPa (@ 20°C)

**Vapor Density:** 2 (Air = 1)

**Volatile:** Not available.

**Odor Threshold:** 62 ppm

**Water/Oil Dist. Coeff.:** The product is more soluble in water; log(oil/water) = -0.2

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water.

**Solubility:** Easily soluble in cold water, hot water.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Excess heat, ignition sources, exposure to moisture, air, or water, incompatible materials.

**Incompatibility with various substances:** Reactive with oxidizing agents, reducing agents, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:** Not available.

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3000 mg/kg [Mouse]. Acute toxicity of the vapor (LC50): 44000 mg/m3 4 hours [Mouse].

**Chronic Effects on Humans:**
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Reproductive system/toxin/male [SUSPECTED]. Causes damage to the following organs: central nervous system (CNS). May cause damage to the following organs: kidneys, the reproductive system, liver, skin.

**Other Toxic Effects on Humans:**
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**
May affect genetic material (mutagenicity) based on studies with yeast (S. cerevisiae), bacteria, and hamster fibroblast cells. May cause reproductive effects (fertility) based upon animal studies. May contain trace amounts of benzene and formaldehyde which may cancer and birth defects. Human: passes the placental barrier.

**Special Remarks on other Toxic Effects on Humans:**
Acute Potential Health Effects: Skin: May cause skin irritation. May be harmful if absorbed through the skin. Eyes: Causes eye irritation, characterized by a burning sensation, redness, tearing, inflammation, and possible corneal injury. Inhalation: Inhalation at high concentrations affects the sense organs, brain and causes respiratory tract irritation. It also may affect the Central Nervous System (behavior) characterized by dizziness, drowsiness, confusion, headache, muscle weakness, and possibly motor incoordination, speech abnormalities, narcotic effects and coma. Inhalation may also affect the gastrointestinal tract (nausea, vomiting). Ingestion: May cause irritation of the digestive (gastrointestinal) tract (nausea, vomiting). It may also
affect the Central Nervous System (behavior), characterized by depression, fatigue, excitement, stupor, coma, headache, altered sleep time, ataxia, tremors as well as at the blood, liver, and urinary system (kidney, bladder, ureter) and endocrine system. May also have musculoskeletal effects. Chronic Potential Health Effects: Skin: May cause dermatitis. Eyes: Eye irritation.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 5540 mg/l 96 hours [Trout]. 8300 mg/l 96 hours [Bluegill]. 7500 mg/l 96 hours [Fathead Minnow].
0.1 ppm any hours [Water flea].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.
Identification: Acetone UNNA: 1090 PG: II
Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause reproductive harm (male) which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Benzene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Benzene.

Other Regulations:

Other Classifications:
WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).
DSCL (EEC):
R11- Highly flammable. R36- Irritating to eyes. S9- Keep container in a well-ventilated place. S16- Keep away from sources of
ignition - No smoking. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

HMIS (U.S.A.):
- Health Hazard: 2
- Fire Hazard: 3
- Reactivity: 0
- Personal Protection: h

National Fire Protection Association (U.S.A.):
- Health: 1
- Flammability: 3
- Reactivity: 0
- Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator
when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
N.Y., Van Nostrand Reinold, 1987. LOLI, RTECS, HSDB databases. Other MSDSs

Other Special Considerations: Not available.

Created: 10/10/2005 08:13 PM
Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Ferrocene, 98%

ACC# 03388

Section 1 - Chemical Product and Company Identification

MSDS Name: Ferrocene, 98%
Catalog Numbers: AC119140000, AC119140050, AC119141000, AC119145000
Synonyms: Biscyclopentadienyliiron; di-2,4-cyclopentadien-1-yliron; ferrotsen; Bis(cyclopentadiene); Iron Dicyclopentadienyl.

Company Identification:
Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>CAS#</th>
<th>Chemical Name</th>
<th>Percent</th>
<th>EINECS/ELINCS</th>
</tr>
</thead>
<tbody>
<tr>
<td>102-54-5</td>
<td>Ferrocene</td>
<td>98.0</td>
<td>203-039-3</td>
</tr>
</tbody>
</table>

Hazard Symbols: XN
Risk Phrases: 22

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: orange. Heat sensitive. Caution! The toxicological properties of this material have not been fully investigated. May cause liver damage. May cause blood abnormalities. May be harmful if swallowed.

Target Organs: Blood, liver.

Potential Health Effects
Eye: No information regarding eye irritation and other potential effects was found.
Skin: No information regarding skin irritation and other potential effects was found.
Ingestion: May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated. May cause blood abnormalities and hepatic cirrhosis.
Inhalation: The toxicological properties of this substance have not been fully investigated. Inhalation of dust may cause respiratory tract irritation.
Chronic: No information found.
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 soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

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 to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician: Treat symptomatically and supportively.

Antidote: None reported.

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.

Extinguishing Media: In case of fire, use water, dry chemical, chemical foam, or alcohol-resistant foam.

Section 6 - Accidental Release Measures

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

Spills/Leaks: Clean up spills immediately, observing precautions in the Protective Equipment section. Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage: Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Use adequate ventilation to keep airborne concentrations low.

Exposure Limits
### Chemical Name

<table>
<thead>
<tr>
<th>Chemical Name</th>
<th>ACGIH</th>
<th>NIOSH</th>
<th>OSHA - Final PELs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ferrocene</td>
<td>10 mg/m3 TWA</td>
<td>total: 10 mg/m3 TWA; respirable dust: 5 mg/m3 TWA</td>
<td>15 mg/m3 TWA (total dust); 5 mg/m3 TWA (respirable fraction)</td>
</tr>
</tbody>
</table>

**OSHA Vacated PELs:** Ferrocene: total dust: 10 mg/m3 TWA; respirable fraction: 5 mg/m3 TWA

**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 gloves to prevent skin exposure.

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

**Respirators:** Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

### Section 9 - Physical and Chemical Properties

**Physical State:** Crystals

**Appearance:** orange

**Odor:** camphor

**pH:** Not available.

**Vapor Pressure:** 0.05 mbar @ 40

**Vapor Density:** Not available.

**Evaporation Rate:** Not available.

**Viscosity:** Not available.

**Boiling Point:** 249 deg C @ 760.00mm Hg

**Freezing/Melting Point:** 173.0 - 174.0 deg C

**Autoignition Temperature:** Not available.

**Flash Point:** Not available.

** Decomposition Temperature:** > 465 deg C

**NFPA Rating:**

**Explosion Limits, Lower:** Not available.

**Upper:** Not available.

**Solubility:** Insoluble.

**Specific Gravity/Density:** Not available.

**Molecular Formula:** C10H10Fe

**Molecular Weight:** 186.04

### Section 10 - Stability and Reactivity

**Chemical Stability:** Stable under normal temperatures and pressures.

**Conditions to Avoid:** Incompatible materials, dust generation, excess heat, strong oxidants.

**Incompatibilities with Other Materials:** Strong oxidizing agents, ammonium perchlorate, tetranitromethane, mercury (III) nitrate

**Hazardous Decomposition Products:** Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.

**Hazardous Polymerization:** Has not been reported.
Section 11 - Toxicological Information

RTECS#:              
CAS# 102-54-5: LK0700000
LD50/LC50:              
CAS# 102-54-5: 
Oral, mouse: LD50 = 832 mg/kg;  
Oral, rat: LD50 = 1320 mg/kg;
Carcinogenicity:              
CAS# 102-54-5: Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA. 
Epidemiology: No information available.  
Teratogenicity: No information available.  
Reproductive Effects: No information available.  
Neurotoxicity: No information available.  
Mutagenicity: No information available.  
Other Studies: No data available.

Section 12 - Ecological Information

No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.  
RCRA P-Series: None listed.  
RCRA U-Series: None listed.

Section 14 - Transport Information

<table>
<thead>
<tr>
<th>US DOT</th>
<th>IATA</th>
<th>RID/ADR</th>
<th>IMO</th>
<th>Canada TDG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shipping Name: No information available.</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Hazard Class:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>UN Number:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Packing Group:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
US FEDERAL

TSCA
CAS# 102-54-5 is listed on the TSCA inventory.

Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.

Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.

Section 12b
None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.

SARA

Section 302 (RQ)
None of the chemicals in this material have an RQ.

Section 302 (TPQ)
None of the chemicals in this product have a TPQ.

Section 313
No chemicals are reportable under Section 313.

Clean Air Act:
This material does not contain any hazardous air pollutants. This material does not contain any Class 1 Ozone depletors. This material does not contain any Class 2 Ozone depletors.

Clean Water Act:
None of the chemicals in this product are listed as Hazardous Substances under the CWA. None of the chemicals in this product are listed as Priority Pollutants under the CWA. None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
CAS# 102-54-5 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols:
XN

Risk Phrases:
R 22 Harmful if swallowed.

Safety Phrases:

WGK (Water Danger/Protection)
CAS# 102-54-5: No information available.

Canada
CAS# 102-54-5 is listed on Canada's DSL List. CAS# 102-54-5 is listed on Canada's DSL List. This product has a WHMIS classification of D2B.
CAS# 102-54-5 is listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 102-54-5: OEL-AUSTRALIA:TWA 10 mg/m3 OEL-BELGIUM:TWA 10 mg/m3 OEL-FINLAND:TWA 10 mg/m3; STEL 20 mg/m3; Skin OEL-FRANCE:TWA 10 mg/m3
Section 16 - Additional Information

MSDS Creation Date: 2/24/1999  
Revision #1 Date: 8/02/2000

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 Fisher 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 Fisher has been advised of the possibility of such damages.
Section 1. Identification

GHS product identifier : Ammonia
Chemical name : ammonia, anhydrous
Other means of identification : ammonia; anhydrous ammonia; Aqueous ammonia; Aqua ammonia
Product use : Synthetic/Analytical chemistry.
Synonym : ammonia; anhydrous ammonia; Aqueous ammonia; Aqua ammonia
SDS # : 001003
Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

24-hour telephone : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).
Classification of the substance or mixture : FLAMMABLE GASES - Category 2
GASES UNDER PRESSURE - Liquefied gas
ACUTE TOXICITY (inhalation) - Category 4
SKIN CORROSION/IRRITATION - Category 1
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 1
AQUATIC HAZARD (ACUTE) - Category 1

GHS label elements
Hazard pictograms :

Signal word : Danger
Hazard statements : Flammable gas.
Contains gas under pressure; may explode if heated.
May cause frostbite.
May form explosive mixtures in Air.
Harmful if inhaled.
Causes severe skin burns and eye damage.
Very toxic to aquatic life.

Precautionary statements
General : Read and follow all Safety Data Sheets (SDS’S) before use. Close valve after each use and when empty. Use equipment rated for cylinder pressure. Do not open valve until connected to equipment prepared for use. Use a back flow preventative device in the piping. Use only equipment of compatible materials of construction. Always keep container in upright position. Approach suspected leak area with caution.
Prevention : Wear protective gloves. Wear eye or face protection. Wear protective clothing. Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking. Use only outdoors or in a well-ventilated area. Avoid release to the environment. Avoid breathing gas. Wash hands thoroughly after handling.
Section 2. Hazards identification

Response:
Collect spillage. IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or physician. IF SWALLOWED: Immediately call a POISON CENTER or physician. Rinse mouth. Do NOT induce vomiting. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. Wash contaminated clothing before reuse. Immediately call a POISON CENTER or physician. 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 or physician. Leaking gas fire: Do not extinguish, unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.

Storage:
Store locked up. Protect from sunlight when ambient temperature exceeds 52°C/125°F. Store in a well-ventilated place.

Disposal:
Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified:
Liquid can cause burns similar to frostbite.

Section 3. Composition/information on ingredients

Substance/mixture: Substance
Chemical name: ammonia, anhydrous
Other means of identification: ammonia; anhydrous ammonia; Aqueous ammonia; Aqua ammonia

CAS number/other identifiers:
CAS number: 7664-41-7
Product code: 001003

Ingredient name | % | CAS number
--- | --- | ---
ammonia, anhydrous | 100 | 7664-41-7

Any concentration shown as a range is to protect confidentiality or is due to batch variation.

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact:
Get medical attention immediately. Call a poison center or physician. Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Chemical burns must be treated promptly by a physician.

Inhalation:
Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.

Skin contact:
Get medical attention immediately. Call a poison center or physician. Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Continue to rinse for at least 10 minutes. In case of contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention. Do not rub affected area. Chemical burns must be treated promptly by a physician. Wash clothing before reuse. Clean shoes thoroughly before reuse.
### Section 4. First aid measures

**Ingestion**: Get medical attention immediately. Call a poison center or physician. Remove victim to fresh air and keep at rest in a position comfortable for breathing. Chemical burns must be treated promptly by a physician. Ingestion of liquid can cause burns similar to frostbite. If frostbite occurs, get medical attention. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband. As this product rapidly becomes a gas when released, refer to the inhalation section.

**Most important symptoms/effects, acute and delayed**

**Potential acute health effects**

- **Eye contact**: Causes serious eye damage. Liquid can cause burns similar to frostbite.
- **Inhalation**: Harmful if inhaled.
- **Skin contact**: Causes severe burns. Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.
- **Frostbite**: Try to warm up the frozen tissues and seek medical attention.
- **Ingestion**: Ingestion of liquid can cause burns similar to frostbite.

**Over-exposure signs/symptoms**

- **Eye contact**: Adverse symptoms may include the following: pain, watering, redness, frostbite
- **Inhalation**: No specific data.
- **Skin contact**: Adverse symptoms may include the following: pain or irritation, redness, blistering may occur, frostbite
- **Ingestion**: Adverse symptoms may include the following: frostbite, stomach pains

**Indication of immediate medical attention and special treatment needed, if necessary**

- **Notes to physician**: In case of inhalation of decomposition products in a fire, symptoms may be delayed. The exposed person may need to be kept under medical surveillance for 48 hours.
- **Specific treatments**: No specific treatment.
- **Protection of first-aiders**: No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

### Section 5. Fire-fighting measures

**Extinguishing media**

- **Suitable extinguishing media**: Use an extinguishing agent suitable for the surrounding fire.
- **Unsuitable extinguishing media**: None known.

**Specific hazards arising from the chemical**

- **Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. This material is very toxic to aquatic life. Fire water contaminated with this material must be contained and prevented from being discharged to any waterway, sewer or drain.**

**Hazardous thermal decomposition products**

- **Decomposition products may include the following materials:** nitrogen oxides
Section 5. Fire-fighting measures

Special protective actions for fire-fighters: Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Contact supplier immediately for specialist advice. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool. If involved in fire, shut off flow immediately if it can be done without risk. If this is impossible, withdraw from area and allow fire to burn. Fight fire from protected location or maximum possible distance. Eliminate all ignition sources if safe to do so.

Special protective equipment for fire-fighters: Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode. For incidents involving large quantities, thermally insulated undergarments and thick textile or leather gloves should be worn.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures:

For non-emergency personnel: Accidental releases pose a serious fire or explosion hazard. No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe gas. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders: If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions: Ensure emergency procedures to deal with accidental gas releases are in place to avoid contamination of the environment. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air). Water polluting material. May be harmful to the environment if released in large quantities. Collect spillage.

Methods and materials for containment and cleaning up:

Small spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment.

Large spill: Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling:

Protective measures: Put on appropriate personal protective equipment (see Section 8). Contains gas under pressure. Do not get in eyes or on skin or clothing. Do not breathe gas. Avoid release to the environment. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Empty containers retain product residue and can be hazardous. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Advice on general occupational hygiene: Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.
# Ammonia

## Section 7. Handling and storage

### Conditions for safe storage, including any incompatibilities

Store in accordance with local regulations. Store in a segregated and approved area. Store away from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10). Store locked up. Eliminate all ignition sources. Keep container tightly closed and sealed until ready for use. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

## Section 8. Exposure controls/personal protection

### Control parameters

**Occupational exposure limits**

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>ammonia, anhydrous</td>
<td>ACGIH TLV (United States, 3/2015).</td>
</tr>
<tr>
<td></td>
<td>STEL: 24 mg/m³ 15 minutes.</td>
</tr>
<tr>
<td></td>
<td>STEL: 35 ppm 15 minutes.</td>
</tr>
<tr>
<td></td>
<td>TWA: 17 mg/m³ 8 hours.</td>
</tr>
<tr>
<td></td>
<td>TWA: 25 ppm 8 hours.</td>
</tr>
<tr>
<td></td>
<td>NIOSH REL (United States, 10/2013).</td>
</tr>
<tr>
<td></td>
<td>STEL: 27 mg/m³ 15 minutes.</td>
</tr>
<tr>
<td></td>
<td>STEL: 35 ppm 15 minutes.</td>
</tr>
<tr>
<td></td>
<td>TWA: 18 mg/m³ 10 hours.</td>
</tr>
<tr>
<td></td>
<td>TWA: 25 ppm 10 hours.</td>
</tr>
<tr>
<td></td>
<td>OSHA PEL (United States, 2/2013).</td>
</tr>
<tr>
<td></td>
<td>TWA: 35 mg/m³ 8 hours.</td>
</tr>
<tr>
<td></td>
<td>TWA: 50 ppm 8 hours.</td>
</tr>
<tr>
<td></td>
<td>STEL: 27 mg/m³ 15 minutes.</td>
</tr>
<tr>
<td></td>
<td>STEL: 35 ppm 15 minutes.</td>
</tr>
</tbody>
</table>

### Appropriate engineering controls

Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

### Environmental exposure controls

Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

### Individual protection measures

#### Hygiene measures

Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

#### Eye/face protection

Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles and/or face shield. If inhalation hazards exist, a full-face respirator may be required instead.

#### Skin protection

Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. If contact with the liquid is possible, insulated gloves suitable for low temperatures should be worn. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

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**Date of issue/Date of revision** : 9/18/2015  
**Date of previous issue** : No previous validation  
**Version** : 0.01  
5/13
Section 8. Exposure controls/personal protection

**Body protection**
Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

**Other skin protection**
Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory protection**
Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

**Appearance**

<table>
<thead>
<tr>
<th>Physical state</th>
<th>Gas. [Liquefied gas]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Color</td>
<td>Colorless.</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>17.03 g/mole</td>
</tr>
<tr>
<td>Molecular formula</td>
<td>H3-N</td>
</tr>
<tr>
<td>Boiling/condensation point</td>
<td>-33°C (-27.4°F)</td>
</tr>
<tr>
<td>Melting/freezing point</td>
<td>-77.7°C (-107.9°F)</td>
</tr>
<tr>
<td>Critical temperature</td>
<td>132.85°C (271.1°F)</td>
</tr>
<tr>
<td>Odor</td>
<td>Pungent.</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not available.</td>
</tr>
<tr>
<td>pH</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not available.</td>
</tr>
<tr>
<td>Burning time</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Burning rate</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>Extremely flammable in the presence of the following materials or conditions: oxidizing materials.</td>
</tr>
</tbody>
</table>

**Lower and upper explosive (flammable) limits**

| Lower: 15.4% |
| Upper: 25%   |

**Vapor pressure**

| 114.1 (psig) |

**Vapor density**

| 0.59 (Air = 1) |

**Specific Volume (ft³/lb)**

| 22.7273 |

**Gas Density (lb/ft³)**

| 0.044 |

**Relative density**

| Not applicable. |

**Solubility**

| Not available. |

**Solubility in water**

| 540 g/l |

**Partition coefficient: n-octanol/water**

| Not available. |

**Auto-ignition temperature**

| 651°C (1203.8°F) |

**Decomposition temperature**

| Not available. |

**SADT**

| Not available. |

**Viscosity**

| Not applicable. |

**Physical/chemical properties comments**

| SPECIFIC GRAVITY (AIR=1): @ 70°F (21.1°C) = 0.59 |
| PH: Approx. 11.6 for 1 N Sol'n. in water |
Section 10. Stability and reactivity

Reactivity : No specific test data related to reactivity available for this product or its ingredients.

Chemical stability : The product is stable.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Oxidizers

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>ammonia, anhydrous</td>
<td>LC50 Inhalation Gas.</td>
<td>Rat</td>
<td>7338 ppm</td>
<td>1 hours</td>
</tr>
</tbody>
</table>

IDLH : 300 ppm

Irritation/Corrosion
Not available.

Sensitization
Not available.

Mutagenicity
Not available.

Carcinogenicity
Not available.

Reproductive toxicity
Not available.

Teratogenicity
Not available.

Specific target organ toxicity (single exposure)
Not available.

Specific target organ toxicity (repeated exposure)
Not available.

Aspiration hazard
Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects
Section 11. Toxicological information

**Eye contact**: Causes serious eye damage. Liquid can cause burns similar to frostbite.

**Inhalation**: Harmful if inhaled.

**Skin contact**: Causes severe burns. Dermal contact with rapidly evaporating liquid could result in freezing of the tissues or frostbite.

**Ingestion**: Ingestion of liquid can cause burns similar to frostbite.

**Symptoms related to the physical, chemical and toxicological characteristics**

**Eye contact**: Adverse symptoms may include the following:, pain, watering, redness, frostbite

**Inhalation**: No specific data.

**Skin contact**: Adverse symptoms may include the following:, pain or irritation, redness, blistering may occur, frostbite

**Ingestion**: Adverse symptoms may include the following:, frostbite, stomach pains

**Delayed and immediate effects and also chronic effects from short and long term exposure**

**Short term exposure**

**Potential immediate effects**: Not available.

**Potential delayed effects**: Not available.

**Long term exposure**

**Potential immediate effects**: Not available.

**Potential delayed effects**: Not available.

**Potential chronic health effects**: Not available.

**General**: No known significant effects or critical hazards.

**Carcinogenicity**: No known significant effects or critical hazards.

**Mutagenicity**: No known significant effects or critical hazards.

**Teratogenicity**: No known significant effects or critical hazards.

**Developmental effects**: No known significant effects or critical hazards.

**Fertility effects**: No known significant effects or critical hazards.

**Numerical measures of toxicity**

**Acute toxicity estimates**

Not available.

**Other information**: IDLH: 300 ppm

Section 12. Ecological information

**Toxicity**

<table>
<thead>
<tr>
<th>Product/ingredient name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>ammonia, anhydrous</td>
<td>Acute EC50 29.2 mg/l Marine water</td>
<td>Algae - Ulva fasciata - Zoea</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 2080 µg/l Fresh water</td>
<td>Crustaceans - Gammarus pulex</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 0.53 ppm Fresh water</td>
<td>Daphnia - Daphnia magna</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 300 µg/l Fresh water</td>
<td>Fish - Hypophthalmichthys nobilis</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 0.204 mg/l Marine water</td>
<td>Fish - Dicentrarchus labrax</td>
<td>62 days</td>
</tr>
</tbody>
</table>

**Persistence and degradability**

Not available.
Ammonia

Section 12. Ecological information

Bioaccumulative potential
Not available.

Mobility in soil

Soil/water partition coefficient ($K_{OC}$): Not available.

Other adverse effects: No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods: The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Empty Airgas-owned pressure vessels should be returned to Airgas. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Empty containers or liners may retain some product residues. Do not puncture or incinerate container.

Section 14. Transport information

<table>
<thead>
<tr>
<th>DOT</th>
<th>TDG</th>
<th>Mexico</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>UN number</td>
<td>UN1005</td>
<td>UN1005</td>
<td>UN1005</td>
<td>UN1005</td>
</tr>
<tr>
<td>UN proper shipping name</td>
<td>AMMONIA, ANHYDROUS</td>
<td>AMMONIA, ANHYDROUS; OR ANHYDROUS AMMONIA</td>
<td>AMMONIA, ANHYDROUS</td>
<td>AMMONIA, ANHYDROUS</td>
</tr>
<tr>
<td>Transport hazard class(es)</td>
<td>2.2</td>
<td>2.3 (8)</td>
<td>2.2</td>
<td>2.3 (8)</td>
</tr>
<tr>
<td>Additional information</td>
<td>Inhaling hazard</td>
<td>This product is not regulated as a marine pollutant when transported on inland waterways in sizes of ≤5 L or ≤5 kg or by road, rail, or inland air in non-bulk sizes, provided the packagings meet the general provisions of §§ 173.24 and 173.24a</td>
<td>Product classified as per the following sections of the Transportation of Dangerous Goods Regulations: 2.13-2.17 (Class 2), 2.40-2.42 (Class 8), 2.7 (Marine pollutant mark). The marine pollutant mark is not required when transported by road or rail.</td>
<td>The marine pollutant mark is not required when transported in sizes of ≤5 L or ≤5 kg. The environmentally hazardous substance mark may appear if required by other transportation regulations. <strong>Passenger and Cargo Aircraft</strong> Quantity limitation: Forbidden <strong>Cargo Aircraft Only</strong> Quantity limitation: Forbidden</td>
</tr>
<tr>
<td>Reportable quantity</td>
<td>100 lbs / 45.4 kg</td>
<td>Packages sizes shipped in quantities less than the product reportable quantity are not subject</td>
<td>Explosive Limit and Limited Quantity Index 0 ERAP Index 3000</td>
<td>-</td>
</tr>
</tbody>
</table>

Date of issue/Date of revision: 9/18/2015
Date of previous issue: No previous validation
Version: 0.01

Mexico

UN1005
AMMONIA, ANHYDROUS; OR ANHYDROUS AMMONIA

DOT
UN1005
AMMONIA, ANHYDROUS

IMDG
UN1005
AMMONIA, ANHYDROUS

IATA
UN1005
AMMONIA, ANHYDROUS
**Section 14. Transport information**

- **Limited quantity**: Yes.
- **Packaging instruction**:
  - **Passenger aircraft**
    - Quantity limitation: Forbidden.
  - **Cargo aircraft**
    - Quantity limitation: Forbidden.

- **Special provisions**: 13,750

**Passenger Carrying**
- **Ship Index**: Forbidden
- **Road or Rail Index**: Forbidden

**Special precautions for user**: Transport within user’s premises: always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

**Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**: Not available.

“Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product.”

**Section 15. Regulatory information**

**U.S. Federal regulations**
- **Clean Water Act (CWA) 311**: ammonia, anhydrous
- **Clean Air Act (CAA) 112 regulated toxic substances**: ammonia, anhydrous

**Clean Air Act (CAA) 112**
- **Section 112 (b) Hazardous Air Pollutants (HAPs)**: Not listed
- **Section 602 Class I Substances**: Not listed
- **Section 602 Class II Substances**: Not listed
- **DEA List I Chemicals (Precursor Chemicals)**: Not listed
- **DEA List II Chemicals (Essential Chemicals)**: Not listed

**TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

**United States inventory (TSCA 8b)**: This material is listed or exempted.

**Clean Water Act (CWA) 311**: ammonia, anhydrous

**Clean Air Act (CAA) 112 regulated toxic substances**: ammonia, anhydrous

**SARA 302/304**

**Composition/information on ingredients**

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>EHS</th>
<th>SARA 302 TPQ (lbs)</th>
<th>SARA 304 RQ (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ammonia, anhydrous</td>
<td>100</td>
<td>Yes.</td>
<td>500</td>
<td>-</td>
</tr>
</tbody>
</table>

**SARA 304 RQ**: 100 lbs / 45.4 kg

**SARA 311/312**

**Classification**: Fire hazard
- Sudden release of pressure
- Immediate (acute) health hazard

**Date of issue/Date of revision**: 9/18/2015
**Date of previous issue**: No previous validation
**Version**: 0.01 10/13
Section 15. Regulatory information

Composition/information on ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>%</th>
<th>Fire hazard</th>
<th>Sudden release of pressure</th>
<th>Reactive</th>
<th>Immediate (acute) health hazard</th>
<th>Delayed (chronic) health hazard</th>
</tr>
</thead>
<tbody>
<tr>
<td>ammonia, anhydrous</td>
<td>100</td>
<td>Yes.</td>
<td>Yes.</td>
<td>No.</td>
<td>Yes.</td>
<td>No.</td>
</tr>
</tbody>
</table>

SARA 313

<table>
<thead>
<tr>
<th>Product name</th>
<th>CAS number</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Form R - Reporting requirements</td>
<td>ammonia, anhydrous</td>
<td>7664-41-7</td>
</tr>
<tr>
<td>Supplier notification</td>
<td>ammonia, anhydrous</td>
<td>7664-41-7</td>
</tr>
</tbody>
</table>

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts: This material is listed.
New York: This material is listed.
New Jersey: This material is listed.
Pennsylvania: This material is listed.

International regulations

International lists

National inventory

Australia: This material is listed or exempted.
Canada: This material is listed or exempted.
China: This material is listed or exempted.
Europe: This material is listed or exempted.
Japan: This material is listed or exempted.
Malaysia: This material is listed or exempted.
New Zealand: This material is listed or exempted.
Philippines: This material is listed or exempted.
Republic of Korea: This material is listed or exempted.
Taiwan: This material is listed or exempted.

Canada WHMIS (Canada): Class A: Compressed gas.
                        Class B-1: Flammable gas.
                        Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
                        Class E: Corrosive material

                        CEPA Toxic substances: This material is listed.
                        Canadian ARET: This material is not listed.
                        Canadian NPI: This material is listed.
                        Alberta Designated Substances: This material is not listed.
                        Ontario Designated Substances: This material is not listed.
                        Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements: Class A: Compressed gas.
                         Class B-1: Flammable gas.
                         Class D-1A: Material causing immediate and serious toxic effects (Very toxic).
                         Class E: Corrosive material

Hazardous Material Information System (U.S.A.)

Date of issue/Date of revision: 9/18/2015
Date of previous issue: No previous validation
Version: 0.01
11/13
Section 16. Other information

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on SDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Procedure used to derive the classification

<table>
<thead>
<tr>
<th>Classification</th>
<th>Justification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flam. Gas 2, H221</td>
<td>Expert judgment</td>
</tr>
<tr>
<td>Acute Tox. 4, H332</td>
<td>Expert judgment</td>
</tr>
<tr>
<td>Skin Corr. 1, H314</td>
<td>Expert judgment</td>
</tr>
<tr>
<td>Eye Dam. 1, H318</td>
<td>Expert judgment</td>
</tr>
<tr>
<td>Aquatic Acute 1, H400</td>
<td>Expert judgment</td>
</tr>
</tbody>
</table>

History

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Date of previous issue : No previous validation
Version : 0.01

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
UN = United Nations

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader
Section 16. Other information

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
Material Safety Data Sheet

Flammable Gas Mixture: Disilane 0.2-5% / Nitrogen 95-99%

Section 1. Chemical product and company identification

Product Name: Flammable Gas Mixture: Disilane 0.2-5% / Nitrogen 95-99%
Supplier: AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use: Synthetic/Analytical chemistry.
MSDS#: 007756
Date of Preparation/Revision: 12/24/2007.
In case of emergency: 1-866-734-3438

Section 2. Hazards identification

Physical state: Gas.
Emergency overview: Warning!
Flammable Gas.
May cause thermal burns.
Contents under pressure.
Vapor may cause flash fire.
Keep away from heat, sparks and flame. Do not puncture or incinerate container. Keep container closed. Use only with adequate ventilation.
Contact with rapidly expanding gases can cause frostbite.

Routes of entry: Inhalation

Potential acute health effects
Eyes: No known significant effects or critical hazards.
Skin: No known significant effects or critical hazards.
Inhalation: Acts as a simple asphyxiant.
Ingestion: Ingestion is not a normal route of exposure for gases

Potential chronic health effects: CARCINOGENIC EFFECTS Not available.
MUTAGENIC EFFECTS Not available.
TERATOGENIC EFFECTS: Not available.

Medical conditions aggravated by overexposure: Acute or chronic respiratory conditions may be aggravated by overexposure to this gas.

See toxicological Information (section 11)

Section 3. Composition, Information on Ingredients

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS number</th>
<th>% Volume</th>
<th>Exposure limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen</td>
<td>7727-37-9</td>
<td>95 - 99</td>
<td></td>
</tr>
<tr>
<td>Disilane</td>
<td>1590-87-0</td>
<td>0.2 - 5</td>
<td></td>
</tr>
</tbody>
</table>

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training. If fumes are still suspected to be present, the rescuer should wear an appropriate mask or a self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact: In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation occurs.

Skin contact: In case of contact, immediately flush skin with plenty of water. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Frostbite: Try to warm up the frozen tissues and seek medical attention.
**Flammable Gas Mixture: Disilane 0.2-5% / Nitrogen 95-99%**

**Inhalation**
If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

**Ingestion**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention if symptoms appear.

### Section 5. Fire fighting measures

**Flammability of the product**
Flammable.

**Auto-ignition temperature**
The lowest known value is 54.444°C (130°F) (disilane).

**Products of combustion**
These products are nitrogen oxides (NO, NO₂...). Some metallic oxides.

**Fire fighting media and instructions**
If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

If inhaled, remove to fresh air. If breathing is difficult, give oxygen. If not breathing, give artificial respiration. Get medical attention.

Extremely flammable. Gas may accumulate in confined areas, travel considerable distance to source of ignition and flash back causing fire or explosion.

Special protective equipment for fire-fighters
Fire fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full facepiece operated in positive pressure mode.

### Section 6. Accidental release measures

**Personal precautions**
Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (Section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

**Environmental precautions**
Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

### Section 7. Handling and storage

**Handling**
Keep container closed. Use only with adequate ventilation. Keep away from heat, sparks and flame. To avoid fire, minimize ignition sources. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Do not puncture or incinerate container. High pressure gas. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

**Storage**
Keep container tightly closed. Keep container in a cool, well-ventilated area. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

### Section 8. Exposure Controls, Personal Protection

**Engineering controls**
Use only with adequate ventilation. Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. The engineering controls also need to keep gas, vapor or dust concentrations below any explosive limits. Use explosion-proof ventilation equipment.

**Personal protection**

**Eyes**
Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

**Skin**
Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

**Respiratory**
Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93
Flammable Gas Mixture: Disilane 0.2-5% / Nitrogen 95-99%

Consult local authorities for acceptable exposure limits.

Personal protection in case of a large spill: A self-contained breathing apparatus should be used to avoid inhalation of the product.

Section 9. Physical and chemical properties

Molecular weight: Not applicable.
Molecular formula: Not applicable.
Boiling/condensation point: Not available.
Melting/freezing point: -132.6°C (-206.7°F) based on data for: disilane. Weighted average: -206.28°C (-339.3°F)
Critical temperature: The lowest known value is -146.9°C (-232.4°F) (nitrogen).
Vapor density: The highest known value is 2.2 (Air = 1) (disilane). Weighted average: 1.03 (Air = 1)
Specific Volume (ft³/lb): Not applicable.
Gas Density (lb/ft³): Weighted average: 0.08

Section 10. Stability and reactivity

Stability and reactivity: The product is stable.
Conditions of instability: Disilane is stable at room temperature and atmospheric pressure. (disilane)
Incompatibility with various substances: Extremely reactive or incompatible with oxidizing agents.

Section 11. Toxicological information

<table>
<thead>
<tr>
<th>Ingredient name</th>
<th>Test</th>
<th>Result</th>
<th>Route</th>
<th>Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Disilane</td>
<td>LC50</td>
<td>19200 ppm (1 hour(s))</td>
<td>Inhalation</td>
<td>Rat</td>
</tr>
</tbody>
</table>

Other toxic effects on humans: Not considered to be toxic for humans.
Specific effects:
- Carcinogenic effects: No known significant effects or critical hazards.
- Mutagenic effects: No known significant effects or critical hazards.
- Reproduction toxicity: No known significant effects or critical hazards.

Section 12. Ecological information

Products of degradation: These products are nitrogen oxides (NO, NO₂...). Some metallic oxides.
Toxicity of the products of biodegradation: The product itself and its products of degradation are not toxic.
Environmental fate: Not available.
Environmental hazards: No known significant effects or critical hazards.
Toxicity to the environment: Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation. Return cylinders with residual product to Airgas, Inc. Do not dispose of locally.
Flammable Gas Mixture: Disilane 0.2-5% / Nitrogen 95-99%

Section 14. Transport information

<table>
<thead>
<tr>
<th>Regulatory information</th>
<th>UN number</th>
<th>Proper shipping name</th>
<th>Class</th>
<th>Packing group</th>
<th>Label</th>
<th>Additional information</th>
</tr>
</thead>
<tbody>
<tr>
<td>DOT Classification</td>
<td>UN1954</td>
<td>COMPRESSED GAS, FLAMMABLE, N.O.S.</td>
<td>2.1</td>
<td>Not applicable (gas).</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TDG Classification</td>
<td>UN1954</td>
<td>COMPRESSED GAS, FLAMMABLE, N.O.S.</td>
<td>2.1</td>
<td>Not applicable (gas).</td>
<td>-</td>
<td>Explosive Limit and Limited Quantity Index 0.125 ERAP Index 3000 Passenger Carrying Ship Index Forbidden Passenger Carrying Road or Rail Index Forbidden</td>
</tr>
<tr>
<td>Mexico Classification</td>
<td>UN1954</td>
<td>COMPRESSED GAS, FLAMMABLE, N.O.S.</td>
<td>2.1</td>
<td>Not applicable (gas).</td>
<td>-</td>
<td></td>
</tr>
</tbody>
</table>

Section 15. Regulatory information

United States

U.S. Federal regulations:
TSCA 8(b) inventory: nitrogen
SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: nitrogen; disilane
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: nitrogen: Sudden Release of Pressure; disilane: Fire hazard
Clean Water Act (CWA) 307: No products were found.
Clean Water Act (CWA) 311: No products were found.
Clean air act (CAA) 112 accidental release prevention: No products were found.
Clean air act (CAA) 112 regulated flammable substances: No products were found.
Clean air act (CAA) 112 regulated toxic substances: No products were found.

State regulations:
Pennsylvania RTK: nitrogen: (generic environmental hazard)
Massachusetts RTK: nitrogen
New Jersey: nitrogen

Canada

WHMIS (Canada):
Class A: Compressed gas.
CEPA DSL: nitrogen
Flammable Gas Mixture: Disilane 0.2-5% / Nitrogen 95-99%

Section 16. Other information

United States
Label Requirements: FLAMMABLE GAS. CONTENTS UNDER PRESSURE. VAPOR MAY CAUSE FLASH FIRE.

Canada
Label Requirements: Class A: Compressed gas.

Hazardous Material Information System (U.S.A.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
</tr>
<tr>
<td>Fire hazard</td>
<td>4</td>
</tr>
<tr>
<td>Reactivity</td>
<td>0</td>
</tr>
<tr>
<td>Personal protection</td>
<td>C</td>
</tr>
</tbody>
</table>

National Fire Protection Association (U.S.A.)

<table>
<thead>
<tr>
<th>Category</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>1</td>
</tr>
<tr>
<td>Instability</td>
<td>0</td>
</tr>
<tr>
<td>Special</td>
<td></td>
</tr>
<tr>
<td>Flammability</td>
<td>4</td>
</tr>
</tbody>
</table>

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above named supplier nor any of its subsidiaries assumes any liability whatsoever for the accuracy or completeness of the information contained herein.

Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.
1. CHEMICAL PRODUCT AND COMPANY INFORMATION

<table>
<thead>
<tr>
<th>Product name</th>
<th>Chemical description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP2MG SSG (BIS CYCLOPENTADIENYL MAGNESIUM)</td>
<td>Bis(cyclopentadienyl)magnesium</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Synonym</th>
<th>Chemical formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>CP2MG Select Semiconductor Grade</td>
<td>(C5 H5)2 Mg</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS number</th>
<th>Chemical family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1284-72-6</td>
<td>Magnesium alkyl</td>
</tr>
</tbody>
</table>

**Supplier**
Akzo Nobel Polymer Chemicals LLC
300 South Riverside Plaza
Chicago, IL 60606
USA

**Medical/Handling Emergency**
+ 1-914-693-6946
Dobbs Ferry, NY USA

**Transportation Emergency**
CHEMTREC - USA: 1-800-424-9300
CANUTEC - CANADA: 1-613-996-6666

**Product use**
Semiconductors

**Product/technical Information**
1-800-828-7929

**Date of first issue**
- -

**Date of last issue / Revision #**
10-20-2000 / 1.00

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage(s)</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bis(cyclopentadienyl)magnesium (Cp2Mg)</td>
<td>100.00</td>
<td>1284-72-6</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

**Emergency overview**
White crystals.
DANGER!
EXTREMELY FLAMMABLE. CATCHES FIRE IF EXPOSED TO AIR.
CAUSES SKIN AND EYE BURNS.
REACTS VIOLENTLY WITH WATER.

Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.

**Health effects**
Skin and eye contact are the primary routes of exposure to this product.
Inhalation of the metal alkyl in this product is unlikely due to the highly reactive nature of the metal alkyl with air and its low vapor pressure.
This material will react with moisture in or on the skin to produce thermal burns.
This product will react with moisture in the eyes to produce severe thermal burns.
Ingestion will result in burning of the mouth, throat and any part of the gastrointestinal system with which the material comes in contact. Nausea and vomiting may occur.

**Carcinogenicity**

<table>
<thead>
<tr>
<th>Description</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>IARC</td>
<td>no</td>
</tr>
<tr>
<td>NTP</td>
<td>no</td>
</tr>
</tbody>
</table>
OSHA  no
ACGIH  no

4. FIRST AID MEASURES

**Inhalation**
Remove victim to fresh air while protecting yourself from exposure with an appropriate respirator. Remove any contaminated clothing to prevent further inhalation exposure. Use gloves to avoid contaminating yourself. If not breathing, clear victim's airway and start artificial respiration. Avoid inhaling expired air. Artificial respiration may be supplemented by the use of a bag-mask respirator or manually triggered oxygen supply capable of delivering one liter per second or more. If victim is breathing, supplemental oxygen may be given from a demand-type or continuous-flow inhaler, preferably with a physician's advice. Monitor breathing and pulse. If victim stops breathing, restart artificial respiration. If heart has stopped, begin cardiopulmonary resuscitation immediately. Keep person warm and at rest. Get medical attention immediately.

**Skin**
Immediately, without delay, very gently blot excess chemical from skin while wearing impervious gloves and air tight safety goggles. If victim is wearing air tight safety goggles, do not remove them. Take care not to contaminate the victim's healthy skin and eyes. Wash all affected areas with plenty of water for at least 15 minutes. Do not break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it. Do not attempt to neutralize with chemical agents. Wash or discard contaminated clothing and shoes. Obtain medical advice immediately.

**Eye**
Immediately flush eyes with large quantities of running water for a minimum of 15 minutes. If the victim is wearing contact lenses, remove them. Take care not to contaminate the victim's healthy skin and eyes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids. DO NOT let victim rub eye(s). Do not attempt to neutralize with chemical agents. Get medical attention immediately. Oils or ointments should not be used at this time. Continue flushing for an additional 15 minutes if a physician is not immediately available.

**Ingestion**
Do NOT induce vomiting. Call a physician or a poison control center immediately. Give victim plenty of water to drink. Never give anything by mouth to an unconscious or convulsing person. Get medical attention immediately.

**Note to physician**
There are no data available that address medical conditions that are generally recognized as being aggravated by exposure to this product.

Attending physician should treat exposed patients symptomatically. Treat thermal burns, if present. Flush eyes with buffered or plain irrigating solutions. If any ulceration or conjunctival injury is present, have an ophthalmologist examine the patient.

5. FIRE-FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Flash point</th>
<th>Autoignition temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrophoric! (ignites in air.)</td>
<td>Ignites spontaneously in air</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Flash Method</th>
<th>Explosion limits</th>
</tr>
</thead>
<tbody>
<tr>
<td>N/A</td>
<td>lower: N/D</td>
</tr>
</tbody>
</table>

|             | upper: N/D       |

**Extinguishing media**
THE MOST EFFECTIVE FIRE EXTINGUISHING AGENT IS DRY CHEMICAL POWDER PRESSURIZED WITH NITROGEN. Vermiculite or dry sand may also be used. CAUTION: REIGNITION MAY OCCUR. DO NOT USE FOAM, WATER (except as explained below), CARBON TETRACHLORIDE OR CHLOROBROMOMETHANE extinguishing agents as product either reacts violently or liberates toxic fumes and vapors on contact with these agents.
Fire fighting procedures
Protecting against fire by strict adherence to safe operating procedures and proper equipment are the best ways to minimize the possibility of fire damage. Immediate action should be taken to confine the fire. All lines and equipment which could contribute to the fire should be shut off.
Standard fireman’s bunker gear is recommended for fighting metal alkyl fires. If the fire cannot be controlled with extinguishing agents, keep a safe distance, protect adjacent property and allow burn until consumed.
Human exposure must be prevented and nonessential personnel evacuated from the immediate area. Breathing vapors from metal alkyl/hydrocarbon fires should be avoided by using proper respiratory equipment. A NIOSH approved, positive-pressure/pressure demand, air-supplied, full-face respirator should be used.

Fire and explosion hazards
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished. This material reacts with air, water and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react upon contact with this product. Do not cut, grind, drill or weld on or near the container (even empty) of this product because an explosion may result. Keep away from heat, sparks and flame.

Hazardous products of combustion
Products of complete combustion are carbon dioxide, water and magnesium oxide. Additionally, products of incomplete combustion may include carbon monoxide, elemental carbon and hydrocarbons (alkanes and alkenes).

NFPA ratings
<table>
<thead>
<tr>
<th>Hazard</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>3</td>
</tr>
<tr>
<td>Flammability</td>
<td>3</td>
</tr>
<tr>
<td>Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>-W</td>
</tr>
</tbody>
</table>

6. ACCIDENTAL RELEASE MEASURES

Methods for cleaning up
Appropriate personal protective equipment (PPE) should be worn while working with spilled material. Block off source of spill. Spilled material will likely give off smoke and fumes. Ignition may occur immediately. Spill may be washed away cautiously with large quantities of water. Use water spray to reduce vapors. CAUTION: Water may cause ignition/ reignition to occur. Dike water for later disposal. Do not allow contaminated water to enter waterways.

7. HANDLING AND STORAGE

Handling
Electrically grounded tanks and containers should always be used as should non-sparking, electrically grounded hand tools and appliances. Ground or bond to ground all vessels when transferring to prevent the accumulation of static electricity. See National Electric Code.

Storage
Store under an inert atmosphere. Nitrogen with less than 5 ppm each moisture and oxygen is recommended. Containers should be stored in a cool, well-ventilated area away from flammable materials and sources of heat. Exercise due caution to prevent damage or leakage from the container.

Maximum storage temperature
not determined

General comments
Under inert conditions the product is not corrosive to metals commonly used in construction. Some plastics and elastomers may be attacked. Contact Akzo Nobel Polymer Chemicals LLC for specific recommendations regarding suitable materials for use with this product.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Respiratory protection**
This material is normally handled under nitrogen and closed process conditions. In an emergency where adequate ventilation is not available and conditions could generate fume, mist or aerosol, inhalation must be prevented through the use of NIOSH-approved organic vapor/acid gas respirators with dust, mist and fume filters to reduce potential for exposure. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure/pressure-demand, air-supplied respirator. When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the workshift) to assure breakthrough exposure does not occur.

**Skin protection**
Skin contact must be prevented through the use of fire-retardant clothing. During sampling, disconnecting lines or opening connections, additional protective outerwear including a full-face shield, impervious gloves, aluminized suit, a hard hat, steel toed safety shoes that cover the ankles and chemical safety glasses should also be worn.

**Eye protection**
Because eye contact with this product may cause severe and possibly permanent damage, chemical goggles and/or a full face shield must be worn whenever handling this product.

**Ventilation protection**
This material is normally handled under closed process conditions.

**Other information**
This product should not be used until all personnel handling it have been thoroughly trained. Contact Akzo Nobel Polymer Chemicals LLC, Chicago, IL. Additional information on safety and handling of organometallics is available in the Akzo Nobel Polymer Chemicals LLC brochure on metal alkyls.

During the development of safe handling procedures, consideration should be given to the need for cleaning of equipment and piping systems to render them nonhazardous before maintenance and repair activities are performed. Waste resulting from these procedures should be handled in an environmentally safe manner.

All food and smoking materials should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for exposure to this material. Before eating, hands and face should be thoroughly washed.

Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freezeups in cold weather.

**Applicable exposure limits**
Other than any exposure limits which may be displayed in Section 8, there are no other known exposure limits applicable to this product.

### Agency

<table>
<thead>
<tr>
<th>Value/Unit of measurement</th>
<th>Value/Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL = Permissible Exposure Limit</td>
<td></td>
</tr>
<tr>
<td>TLV = Threshold Limit Value</td>
<td></td>
</tr>
<tr>
<td>TWA = Time Weighted Average</td>
<td></td>
</tr>
<tr>
<td>STEL = Short Term Exposure Limit</td>
<td></td>
</tr>
<tr>
<td>CEIL = Ceiling Exposure Limit</td>
<td></td>
</tr>
<tr>
<td>REL = Recommended Exposure Limit</td>
<td></td>
</tr>
<tr>
<td>WEEL = Workplace Environmental Exposure Limit</td>
<td></td>
</tr>
<tr>
<td>IDLH = Immediate Dangerous to Life and Health</td>
<td></td>
</tr>
</tbody>
</table>

9. PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Appearance and Odor</th>
<th>pH value</th>
</tr>
</thead>
<tbody>
<tr>
<td>White crystals.</td>
<td>not determined</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Odor threshold (ppm)</th>
<th>Relative vapor density (air=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>not determined</td>
<td>not determined</td>
</tr>
</tbody>
</table>

Other than any exposure limits which may be displayed in Section 8, there are no other known exposure limits applicable to this product.
### Physical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Volatile %</strong></td>
<td>approx. 100 % by weight</td>
</tr>
<tr>
<td><strong>Vapor pressure (mm Hg)</strong></td>
<td>approx. 0.043 @ 25 C</td>
</tr>
<tr>
<td><strong>Boiling point/range</strong></td>
<td>&gt; 572.00 °F 300.00 °C @ 760 mm Hg (Decomposes)</td>
</tr>
<tr>
<td><strong>Evaporation rate</strong></td>
<td>not determined</td>
</tr>
<tr>
<td><strong>Melting point/range</strong></td>
<td>348.80 °F 176.00 °C</td>
</tr>
<tr>
<td><strong>Cloud point</strong></td>
<td>not determined</td>
</tr>
<tr>
<td><strong>Pour point</strong></td>
<td>not determined</td>
</tr>
<tr>
<td><strong>Flash point</strong></td>
<td>Pyrophoric! (ignites in air.)</td>
</tr>
<tr>
<td><strong>Solubility in water</strong></td>
<td>Reacts violently</td>
</tr>
<tr>
<td><strong>Flash method</strong></td>
<td>N/A</td>
</tr>
<tr>
<td><strong>Solubility in other solvents</strong></td>
<td>Miscible in sat hydrocarbons</td>
</tr>
<tr>
<td><strong>Autoignition temperature</strong></td>
<td>Ignites spontaneously in air</td>
</tr>
<tr>
<td><strong>Specific Gravity/Density</strong></td>
<td>not determined</td>
</tr>
<tr>
<td><strong>Partition coefficient n-octanol/water</strong></td>
<td>not determined</td>
</tr>
<tr>
<td><strong>Bulk density</strong></td>
<td>not determined</td>
</tr>
<tr>
<td><strong>Explosion limits</strong></td>
<td>lower: N/D, upper: N/D</td>
</tr>
</tbody>
</table>

### Stability and Reactivity

**Stability**
This product is stable when stored under a dry, inert atmosphere and away from heat. Nitrogen containing less than 5 ppm each moisture and oxygen is recommended. This product is not sensitive to impact.

**Incompatibilities**
This product may react violently with air, water, and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react vigorously upon contact with the product.

**Polymerization**
Hazardous polymerization is not expected to occur.

**Decomposition**
Magnesium alkyls from Akzo Nobel Polymer Chemicals LLC are thermally stable products. Most show little or no decomposition at temperatures at least up to 140 C (284 F). Products of thermal decomposition include magnesium hydride and olefins.

**Conditions to avoid**
Avoid contact with incompatible material, excessive heat and flames.

### Toxicological Information

**Oral LD50**
Ingestion toxicity data are not available for this product.

**Dermal LD50**
Dermal toxicity data are not available for this product.

**Inhalation LC50**
Inhalation toxicity data are not available for this product.

**Skin**
Chronic dermal exposure effects for this product are not known. Skin contact with this product will cause severe chemical burns.
### Eye

The acute eye effects of this product have not been determined. However, severe chemical and thermal burns can occur and may cause permanent eye damage.

### Chronic toxicity/carcinogenicity

Chronic ingestion effects of this product are not known. Ingestion will result in burns of the mouth, throat, esophagus and digestive tract.

Chronic inhalation exposure effects for this product are not known.

The carcinogenic/mutagenic properties of this product are not known.

The reproductive toxicity of this product is not known.

The neurotoxic effects of this product are not known.

Overexposure to this product may affect the skin, eyes and respiratory system.

### Other toxicological information

No other toxic effects for this product are known.

### 12. ECOLOGICAL INFORMATION

**Ecotoxicological information**

The ecological toxicity of this product is not known.

**Bioaccumulation**

Chemical fate information on this product is not known.

**Other information**

Other ecological information on this product is not known.

### 13. DISPOSAL CONSIDERATIONS

**Waste disposal in accordance with regulations**

Incineration by controlled feed of air and product is a suitable disposal procedure. Alternately, deactivation can be achieved by diluting the product with hydrocarbon (heptane, etc.) to less than 5 weight percent metal alkyl concentration and treating the hydrocarbon solution with water under a nitrogen atmosphere in a vented and agitated container. Always add the diluted metal alkyl solution to a large excess of water. Allow for the generation of heat and flammable hydrocarbons when treating with water. Conduct water treatment in the absence of air to avoid possible ignition of flammable material. The products from hydrolysis are hydrocarbons and magnesium oxide.

Consult RCRA hazardous waste regulations prior to deactivation for potential treatment permitting considerations.

Should the unused product become a waste material, it would meet the characteristics of an ignitable and reactive waste per 40 CFR 261, Subpart C. It is the responsibility of the waste generator to determine if his wastes are hazardous by characteristics or listing.

Note: A technical bulletin (No. 95-90) is available from Akzo Nobel Polymer Chemicals LLC describing details of disposal of laboratory quantities of metal alkyls.

**Container disposal**

Bubbler cylinders containing residue are returnable to Akzo Nobel Polymer Chemicals LLC, 730 Battleground Road, Deer Park, TX 77536. Return shipments of containers are to be in compliance with DOT regulations.
### 14. TRANSPORT INFORMATION

<table>
<thead>
<tr>
<th>Shipping description</th>
<th>METAL ALKYLs, WATER-REACTIVE, N.O.S. (BIS(CYCLOPENTADIENYL)MAGNESIUM) 4.2; UN2003, I</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Required labels</th>
<th>Primary Label: SPONTANEOUSLY COMBUSTIBLE Subsidiary Label: DANGEROUS WHEN WET</th>
</tr>
</thead>
</table>

| Environmentally hazardous substance | This product does not contain an environmentally hazardous substance per 49 CFR 172.101, Appendix A. |

### 15. REGULATORY INFORMATION

Products and/or components listed below are subject to the following:

<table>
<thead>
<tr>
<th>Hazard classes</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMIS Hazard Rating Source</td>
<td>HMIS</td>
</tr>
<tr>
<td>HMIS Health</td>
<td>3</td>
</tr>
<tr>
<td>HMIS Flammability</td>
<td>3</td>
</tr>
<tr>
<td>HMIS Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>WHMIS Hazard Class</td>
<td>B-6; D-2B; E; F</td>
</tr>
</tbody>
</table>

Other regulatory information

Bis(cyclopentadienyl)magnesium is on the TSCA inventory.

### 16. OTHER INFORMATION

Other information

No other information is available.

Created by

PRODUCT SAFETY 914/674-5000

The information in this material safety data sheet should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable as of the date of publication. However, no warranty is made as to the accuracy of and/or sufficiency of such information and/or suggestions as to the merchantability or fitness of the product for any particular purpose, or that any suggested use will not infringe any patent. Nothing in here shall be construed as granting or extending any license under any patent. Buyer must determine for himself, by preliminary tests or otherwise, the suitability of this product for his purposes, including mixing with other products. The information contained herein supersedes all previously issued bulletins on the subject matter covered. If the date on this document is more than three years old, call to make certain that this sheet is current.
TEG SSG (TRIETHYLGALLIUM)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

<table>
<thead>
<tr>
<th>Product name</th>
<th>Chemical description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEG SSG (TRIETHYLGALLIUM)</td>
<td>Triethylgallium</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Synonym</th>
<th>Chemical formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>TEG Select Semiconductor Grade</td>
<td>C6 H15 Ga</td>
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</table>

<table>
<thead>
<tr>
<th>CAS number</th>
<th>Chemical family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1115-99-7</td>
<td>Gallium alkyls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Medical/Handling Emergency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akzo Nobel Polymer Chemicals LLC</td>
<td>+ 1-914-693-6946</td>
</tr>
<tr>
<td>300 South Riverside Plaza</td>
<td>Dobbs Ferry, NY USA</td>
</tr>
<tr>
<td>Chicago, IL 60606 USA</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplier</th>
<th>Transportation Emergency</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEMTREC - USA: 1-800-424-9300</td>
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</tr>
<tr>
<td>CANUTEC - CANADA: 1-613-996-6666</td>
<td></td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Product use</th>
<th>Product/technical Information</th>
</tr>
</thead>
<tbody>
<tr>
<td>Semiconductors</td>
<td>1-800-828-7929</td>
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<table>
<thead>
<tr>
<th>Date of first issue</th>
<th>Date of last issue / Revision #</th>
</tr>
</thead>
<tbody>
<tr>
<td>11-08-1994</td>
<td>06-21-2000 / 5.00</td>
</tr>
</tbody>
</table>

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage(s)</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triethylgallium</td>
<td>100.00</td>
<td>1115-99-7</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

Emergency overview
Clear, colorless liquid.
DANGER!
SPONTANEOUSLY COMBUSTIBLE.
MAY CAUSE FLASH FIRE.
CAUSES SEVERE BURNS TO SKIN AND EYES.
HARMFUL IF SWALLOWED OR INHALED.
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.

Health effects
Skin and eye contact are the primary routes of exposure to this product.
Inhalation of the metal alkyl in this product is unlikely due to the highly reactive nature of the metal alkyl with air and its low vapor pressure.
This material will react with moisture in or on the skin to produce thermal and chemical burns.
This product will react with moisture in the eyes to produce severe chemical and thermal burns.
Ingestion will result in burning of the mouth, throat and any part of the gastrointestinal system with which the material comes in contact. Nausea and vomiting may occur.

Carcinogenicity

<table>
<thead>
<tr>
<th>Description</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>IARC</td>
<td>no</td>
</tr>
<tr>
<td>NTP</td>
<td>no</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

Inhalation
Remove victim to fresh air while protecting yourself from exposure with an appropriate respirator. Remove any contaminated clothing to prevent further inhalation exposure. Use gloves to avoid contaminating yourself. If not breathing, clear victim's airway and start artificial respiration. Avoid inhaling expired air. Artificial respiration may be supplemented by the use of a bag-mask respirator or manually triggered oxygen supply capable of delivering one liter per second or more. If victim is breathing, supplemental oxygen may be given from a demand-type or continuous-flow inhaler, preferably with a physician's advice. Monitor breathing and pulse. If victim stops breathing, restart artificial respiration. If heart has stopped, begin cardiopulmonary resuscitation immediately. Keep person warm and at rest. Get medical attention immediately.

Skin
Immediately, without delay, very gently blot excess chemical from skin while wearing impervious gloves and air tight safety goggles. If victim is wearing air tight safety goggles, do not remove them. Take care not to contaminate the victim's healthy skin and eyes. Wash all affected areas with plenty of water for at least 15 minutes. Do not break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it. Do not attempt to neutralize with chemical agents. Wash or discard contaminated clothing and shoes. Obtain medical advice immediately.

Eye
Immediately flush eyes with large quantities of running water for a minimum of 15 minutes. If the victim is wearing contact lenses, remove them. Take care not to contaminate the victim's healthy skin and eyes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids. DO NOT let victim rub eye(s). Do not attempt to neutralize with chemical agents. Get medical attention immediately. Oils or ointments should not be used at this time. Continue flushing for an additional 15 minutes if a physician is not immediately available.

Ingestion
Do NOT induce vomiting. Call a physician or a poison control center immediately. Give victim plenty of water to drink. Never give anything by mouth to an unconscious or convulsing person. Get medical attention immediately.

Note to physician
There are no data available that address medical conditions that are generally recognized as being aggravated by exposure to this product.

Attending physician should treat exposed patients symptomatically. Chemical burns on the skin should be treated as thermal burns. Flush eyes with buffered or plain irrigating solutions. If any ulceration or conjunctival injury is present, have an ophthalmologist examine the patient.

5. FIRE-FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Flash point</th>
<th>Autoignition temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrophoric! (ignites in air.)</td>
<td>Ignites spontaneously in air.</td>
</tr>
</tbody>
</table>

Flash Method
N/A

Explosion limits
lower: N/D
upper: N/D

Extinguishing media
THE MOST EFFECTIVE FIRE EXTINGUISHING AGENT IS DRY CHEMICAL POWDER PRESSURIZED WITH NITROGEN. Vermiculite or dry sand may also be used. CAUTION: REIGNITION MAY OCCUR. DO NOT USE FOAM, WATER (except as explained below), CARBON TETRACHLORIDE OR CHLOROBROMOMETHANE extinguishing agents as product either reacts violently or liberates toxic fumes and vapors on contact with these agents.
TEG SSG (TRIETHYLGALLIUM)

Fire fighting procedures
Protecting against fire by strict adherence to safe operating procedures and proper equipment are the best ways to minimize the possibility of fire damage. Immediate action should be taken to confine the fire. All lines and equipment which could contribute to the fire should be shut off.
Standard fireman's bunker gear is recommended for fighting metal alkyl fires. If the fire cannot be controlled with extinguishing agents, keep a safe distance, protect adjacent property and allow burn until consumed.
Human exposure must be prevented and nonessential personnel evacuated from the immediate area.
Breathing vapors from metal alkyl/hydrocarbon fires should be avoided by using proper respiratory equipment. A NIOSH approved, positive-pressure/pressure demand, air-supplied, full-face respirator should be used.

Fire and explosion hazards
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.
This material reacts with air, water and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react upon contact with this product.
Do not cut, grind, drill or weld on or near the container (even empty) of this product because an explosion may result. Keep away from heat, sparks and flame.

Hazardous products of combustion
Carbon monoxide, carbon dioxide, and gallium oxide fumes.

NFPA ratings

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>3</td>
</tr>
<tr>
<td>Flammability</td>
<td>4</td>
</tr>
<tr>
<td>Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>-W</td>
</tr>
</tbody>
</table>

6. ACCIDENTAL RELEASE MEASURES

Methods for cleaning up
Appropriate personal protective equipment (PPE) should be worn while working with spilled material. Block off source of spill. Spilled material will likely give off smoke and fumes. Ignition may occur immediately.
Spill may be washed away cautiously with large quantities of water. Use water spray to reduce vapors.
CAUTION: Water may cause ignition/ reignition to occur. Dike water for later disposal. Do not allow contaminated water to enter waterways.

7. HANDLING AND STORAGE

Handling
Electrically grounded tanks and containers should always be used as should non-sparking, electrically grounded hand tools and appliances. Ground or bond to ground all vessels when transferring to prevent the accumulation of static electricity. See National Electric Code.

Storage
Store under an inert atmosphere. Dry nitrogen is a suitable inert gas. Containers should be stored in a cool, well-ventilated area away from flammable materials and sources of heat. Exercise due caution to prevent damage to or leakage from the container.

Maximum storage temperature
not determined

General comments
Under inert conditions the product is not corrosive to metals commonly used in construction. Some plastics and elastomers may be attacked. Contact Akzo Nobel Polymer Chemicals LLC for specific recommendations regarding suitable materials for use with this product.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory protection
This material is normally handled under nitrogen and closed process conditions. In an emergency where adequate ventilation is not available and conditions could generate fume, mist or aerosol, inhalation must be prevented through the use of NIOSH-approved organic vapor/acid gas respirators with dust, mist and fume filters to reduce potential for exposure. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure/pressure-demand, air-supplied respirator. When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the workshift) to assure breakthrough exposure does not occur.

Skin protection
Skin contact must be prevented through the use of fire-retardant clothing. During sampling, disconnecting lines or opening connections, additional protective outerwear including full-face shield, impervious gloves, aluminized suit, a hard hat, steel toed safety shoes that cover the ankles and chemical safety goggles should also be worn.

Eye protection
Because eye contact with this product may cause severe and possibly permanent damage, chemical goggles and/or a full face shield must be worn whenever handling this product.

Ventilation protection
This material is normally handled under closed process conditions.

Other information
This product should not be used until all personnel handling it have been thoroughly trained. Contact Akzo Nobel Polymer Chemicals LLC, Chicago, IL. Additional information on safety and handling of organometallics is available in the Akzo Nobel Polymer Chemicals LLC brochure on metal alkyls. During the development of safe handling procedures, consideration should be given to the need for cleaning of equipment and piping systems to render them nonhazardous before maintenance and repair activities are performed. Waste resulting from these procedures should be handled in an environmentally safe manner. All food and smoking materials should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for exposure to this material. Before eating, hands and face should be thoroughly washed. Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freezeups in cold weather.

Applicable exposure limits
Other than any exposure limits which may be displayed in Section 8, there are no other known exposure limits applicable to this product.

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<tr>
<th>Agency</th>
<th>Value/Unit of measurement</th>
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<tr>
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<td></td>
</tr>
<tr>
<td>TLV = Threshold Limit Value</td>
<td></td>
</tr>
<tr>
<td>TWA = Time Weighted Average</td>
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<td>WEEL = Workplace Environmental Exposure Limit</td>
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<tr>
<td>IDLH = Immediate Dangerous to Life and Health</td>
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9. PHYSICAL AND CHEMICAL PROPERTIES

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<tr>
<th>Appearance and Odor</th>
<th>pH value</th>
</tr>
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<tbody>
<tr>
<td>Clear, colorless liquid.</td>
<td>not determined</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Odor threshold (ppm)</th>
<th>Relative vapor density (air=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>not determined</td>
<td>N/D</td>
</tr>
</tbody>
</table>
### TEG SSG (TRIETHYLGALLIUM)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile %</td>
<td>approx. 100 % by weight</td>
</tr>
<tr>
<td>Boiling point/range</td>
<td>289.40 °F 143.00 °C @ 760 mmHg</td>
</tr>
<tr>
<td>Melting point/range</td>
<td>-115.6 °F -82.00 °C</td>
</tr>
<tr>
<td>Cloud point</td>
<td>N/D</td>
</tr>
<tr>
<td>Pour point</td>
<td>not determined</td>
</tr>
<tr>
<td>Flash point</td>
<td>Pyrophoric! (ignites in air.)</td>
</tr>
<tr>
<td>Flash method</td>
<td>N/A</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>Ignites spontaneously in air.</td>
</tr>
<tr>
<td>Specific Gravity/Density</td>
<td>not determined</td>
</tr>
<tr>
<td>Bulk density</td>
<td>not determined</td>
</tr>
<tr>
<td>Other information</td>
<td>Density = 1.059 g/mL @ 86 F (30 C).</td>
</tr>
<tr>
<td>Vapor pressure (mm Hg)</td>
<td>approx. 16 @ 109 F (43 C)</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>not determined</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Reacts violently</td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>Miscible in sat. hydrocarbons</td>
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<tr>
<td>Partition coefficient n-octanol/water</td>
<td>not determined</td>
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<tr>
<td>Explosion limits</td>
<td>lower: N/D</td>
</tr>
<tr>
<td></td>
<td>upper: N/D</td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

**Stability**

This product is stable when stored under dry, inert atmosphere and away from heat. Dry nitrogen containing less than 5 ppm oxygen and less than 5 ppm of moisture is recommended. This product is not sensitive to physical impact.

**Incompatibilities**

This product may react violently with air, water, and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react vigorously upon contact with the product.

**Polymerization**

Hazardous polymerization is not expected to occur.

**Decomposition**

Gallium oxide fumes, carbon dioxide and water vapor are the products of complete combustion of this product. Incomplete combustion may produce carbon monoxide.

**Conditions to avoid**

Avoid contact with incompatible material, excessive heat and flames.

### 11. TOXICOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Route</th>
<th>Data Availability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral LD50</td>
<td>Ingestion toxicity data are not available for this product.</td>
</tr>
<tr>
<td>Dermal LD50</td>
<td>Dermal toxicity data are not available for this product.</td>
</tr>
<tr>
<td>Inhalation LC50</td>
<td>Inhalation toxicity data are not available for this product.</td>
</tr>
<tr>
<td>Skin</td>
<td>Chronic dermal exposure effects for this product are not known. Skin contact with this product will cause severe chemical burns.</td>
</tr>
</tbody>
</table>
### 12. ECOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Ecotoxicological information</th>
<th>The ecological toxicity of this product is not known.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bioaccumulation</td>
<td>Chemical fate information on this product is not known.</td>
</tr>
<tr>
<td>Other information</td>
<td>Other ecological information on this product is not known.</td>
</tr>
</tbody>
</table>

### 13. DISPOSAL CONSIDERATIONS

- **Waste disposal in accordance with regulations**
  Incineration by controlled feed of air and product is a suitable disposal procedure. Alternately, deactivation can be achieved by diluting the product with hydrocarbon (heptane, etc.) to less than 5 weight percent metal alkyl concentration and treating the hydrocarbon solution with water under a nitrogen atmosphere in a vented and agitated container. Always add the diluted metal alkyl solution to a large excess of water. Allow for the generation of heat and flammable hydrocarbons when treating with water. Conduct water treatment in the absence of air to avoid possible ignition of flammable material. The products from hydrolysis are hydrocarbons and gallium oxide.
  Consult RCRA hazardous waste regulations prior to deactivation for potential treatment permitting considerations.
  Should the unused product become a waste material, it would meet the characteristics of an ignitable and reactive waste per 40 CFR 261, Subpart C. It is the responsibility of the waste generator to determine if his wastes are hazardous by characteristics or listing.
  Note: A technical bulletin (No. 95-90) is available from Akzo Nobel Polymer Chemicals LLC describing details of disposal of laboratory quantities of metal alkyls.

- **Container disposal**
  Containers with residual semiconductor grade metal alkyls may be returned to: Akzo Nobel Polymer Chemicals LLC, 730 Battleground Road, Deer Park, Texas 77536. Return shipments of containers are to be in compliance with DOT regulations.
TEG SSG (TRIETHYLGALLIUM)

14. TRANSPORT INFORMATION

| Shipping description | #METAL ALKYLS, WATER-REACTIVE, N.O.S. (TRIETHYLGALLIUM) 4.2, UN2003, PG I
|                      | NORTH AMERICAN EMERGENCY RESPONSE GUIDE NO. 135
|                      | ICAO: FORBIDDEN
|                      | IMO: UN2003

| Required labels      | Primary Label: SPONTANEOUSLY COMBUSTIBLE
|                      | Subsidiary Label: DANGEROUS WHEN WET

| Environmentally hazardous substance | This product does not contain an environmentally hazardous substance per 49 CFR 172.101, Appendix A.

15. REGULATORY INFORMATION

Products and/or components listed below are subject to the following:

| Triethylgallium                           | Toxic Subst. Cont. Act -listed | yes |

<table>
<thead>
<tr>
<th>Hazard classes</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMIS Hazard Rating Source</td>
<td>HMIS</td>
</tr>
<tr>
<td>HMIS Health</td>
<td>3</td>
</tr>
<tr>
<td>HMIS Flammability</td>
<td>4</td>
</tr>
<tr>
<td>HMIS Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>WHMIS Hazard Class</td>
<td>B-6, D-2B, E, F</td>
</tr>
</tbody>
</table>

Other regulatory information
No other regulatory information is available on this product.

16. OTHER INFORMATION

| Other information                       | No other information is available. |

| Created by                              | PRODUCT SAFETY 914-674-5000 |

The information in this material safety data sheet should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable as of the date of publication. However, no warranty is made as to the accuracy of and/or sufficiency of such information and/or suggestions as to the merchantability or fitness of the product for any particular purpose, or that any suggested use will not infringe any patent. Nothing in here shall be construed as granting or extending any license under any patent. Buyer must determine for himself, by preliminary tests or otherwise, the suitability of this product for his purposes, including mixing with other products. The information contained herein supersedes all previously issued bulletins on the subject matter covered. If the date on this document is more than three years old, call to make certain that this sheet is current.
TMG SSG (TRIMETHYLGALLIUM)

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

<table>
<thead>
<tr>
<th>Product name</th>
<th>Chemical description</th>
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<tbody>
<tr>
<td>TMG SSG (TRIMETHYLGALLIUM)</td>
<td>Trimethylgallium</td>
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<table>
<thead>
<tr>
<th>Synonym</th>
<th>Chemical formula</th>
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</thead>
<tbody>
<tr>
<td>TMG Select Semiconductor Grade</td>
<td>C3 H9 Ga</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS number</th>
<th>Chemical family</th>
</tr>
</thead>
<tbody>
<tr>
<td>1445-79-0</td>
<td>Gallium alkyls</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Supplier</th>
</tr>
</thead>
<tbody>
<tr>
<td>Akzo Nobel Polymer Chemicals LLC</td>
</tr>
<tr>
<td>300 South Riverside Plaza</td>
</tr>
<tr>
<td>Chicago, IL 60606</td>
</tr>
<tr>
<td>USA</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Medical/Handling Emergency</th>
<th>Transportation Emergency</th>
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</thead>
<tbody>
<tr>
<td>+ 1-914-693-6946</td>
<td>CHEMTREC - USA: 1-800-424-9300</td>
</tr>
<tr>
<td>Dobbs Ferry, NY USA</td>
<td>CANUTEC - CANADA: 1-613-996-6666</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Product use</th>
<th>Product/technical Information</th>
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<tbody>
<tr>
<td>Semiconductors</td>
<td>1-800-828-7929</td>
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</tbody>
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<table>
<thead>
<tr>
<th>Date of first issue</th>
<th>Date of last issue / Revision #</th>
</tr>
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<tbody>
<tr>
<td>10-07-1994</td>
<td>06-21-2000 / 6.00</td>
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</table>

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage(s)</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimethylgallium</td>
<td>100.00</td>
<td>1445-79-0</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

**Emergency overview**
Clear, colorless liquid
DANGER!
SPONTANEOUSLY COMBUSTIBLE.
MAY CAUSE FLASH FIRE.
CAUSES SEVERE BURNS TO SKIN AND EYES.
HARMFUL IF SWALLOWED OR INHALED.
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition.
In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.

**Health effects**
Skin and eye contact are the primary routes of exposure to this product.
Although believed to be relatively non toxic, oxidized vapors are irritating to the respiratory system and have an extremely low detectable odor level.
This material will react with moisture in or on the skin to produce thermal and chemical burns.
This product will react with moisture in the eyes to produce severe chemical and thermal burns.
Ingestion will result in burning of the mouth, throat and any part of the gastrointestinal system with which the material comes in contact. Nausea and vomiting may occur.

**Carcinogenicity**

<table>
<thead>
<tr>
<th>Description</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>IARC</td>
<td>no</td>
</tr>
<tr>
<td>NTP</td>
<td>no</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

**Inhalation**
Remove victim to fresh air while protecting yourself from exposure with an appropriate respirator. Remove any contaminated clothing to prevent further inhalation exposure. Use gloves to avoid contaminating yourself. If not breathing, clear victim's airway and start artificial respiration. Avoid inhaling expired air. Artificial respiration may be supplemented by the use of a bag-mask respirator or manually triggered oxygen supply capable of delivering one liter per second or more. If victim is breathing, supplemental oxygen may be given from a demand-type or continuous-flow inhaler, preferably with a physician's advice. Monitor breathing and pulse. If victim stops breathing, restart artificial respiration. If heart has stopped, begin cardiopulmonary resuscitation immediately. Keep person warm and at rest. Get medical attention immediately.

**Skin**
Immediately, without delay, very gently blot excess chemical from skin while wearing impervious gloves and air tight safety goggles. If victim is wearing air tight safety goggles, do not remove them. Take care not to contaminate the victim's healthy skin and eyes. Wash all affected areas with plenty of water for at least 15 minutes. Do not break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it. Do not attempt to neutralize with chemical agents. Wash or discard contaminated clothing and shoes. Obtain medical advice immediately.

**Eye**
Immediately flush eyes with large quantities of running water for a minimum of 15 minutes. If the victim is wearing contact lenses, remove them. Take care not to contaminate the victim's healthy skin and eyes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids. DO NOT let victim rub eye(s). Do not attempt to neutralize with chemical agents. Get medical attention immediately. Oils or ointments should not be used at this time. Continue flushing for an additional 15 minutes if a physician is not immediately available.

**Ingestion**
Do NOT induce vomiting. Call a physician or a poison control center immediately. Give victim plenty of water to drink. Never give anything by mouth to an unconscious or convulsing person. Get medical attention immediately.

**Note to physician**
There are no data available that address medical conditions that are generally recognized as being aggravated by exposure to this product.

Attending physician should treat exposed patients symptomatically. Chemical burns on the skin should be treated as thermal burns. Flush eyes with buffered or plain irrigating solutions. If any ulceration or conjunctival injury is present, have an ophthalmologist examine the patient.

5. FIRE-FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Flash point</th>
<th>Autoignition temperature</th>
</tr>
</thead>
<tbody>
<tr>
<td>Pyrophoric! (ignites in air.)</td>
<td>Ignot spontaneous in air.</td>
</tr>
</tbody>
</table>

**Flash Method**
N/A

**Explosion limits**
lower: N/D
upper: N/D

**Extinguishing media**
THE MOST EFFECTIVE FIRE EXTINGUISHING AGENT IS DRY CHEMICAL POWDER PRESSURIZED WITH NITROGEN. Vermiculite or dry sand may also be used. CAUTION: REIGNITION MAY OCCUR. DO NOT USE FOAM, WATER (except as explained below), CARBON TETRACHLORIDE OR CHLOROBROMOMETHANE extinguishing agents as product either reacts violently or liberates toxic fumes and vapors on contact with these agents.
Fire fighting procedures
Protecting against fire by strict adherence to safe operating procedures and proper equipment are the best ways to minimize the possibility of fire damage. Immediate action should be taken to confine the fire. All lines and equipment which could contribute to the fire should be shut off.
Standard fireman's bunker gear is recommended for fighting metal alkyl fires. If the fire cannot be controlled with extinguishing agents, keep a safe distance, protect adjacent property and allow burn until consumed. Human exposure must be prevented and nonessential personnel evacuated from the immediate area. Breathing vapors from metal alkyl/hydrocarbon fires should be avoided by using proper respiratory equipment. A NIOSH approved, positive-pressure/pressure demand, air-supplied, full-face respirator should be used.

Fire and explosion hazards
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished. This material reacts with air, water and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react upon contact with this product. Do not cut, grind, drill or weld on or near the container (even empty) of this product because an explosion may result. Keep away from heat, sparks and flame.

Hazardous products of combustion
Carbon monoxide, carbon dioxide, and gallium oxide fumes.

NFPA ratings

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<td>Reactivity</td>
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</tr>
<tr>
<td>Other</td>
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6. ACCIDENTAL RELEASE MEASURES

Methods for cleaning up
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7. HANDLING AND STORAGE

Handling
Electrically grounded tanks and containers should always be used as should non-sparking, electrically grounded hand tools and appliances. Ground or bond to ground all vessels when transferring to prevent the accumulation of static electricity. See National Electric Code.

Storage
Store under an inert atmosphere. Dry nitrogen is a suitable inert gas. Containers should be stored in a cool, well-ventilated area away from flammable materials and sources of heat. Exercise due caution to prevent damage to or leakage from the container.

Maximum storage temperature
not determined

General comments
Under inert conditions the product is not corrosive to metals commonly used in construction. Some plastics and elastomers may be attacked. Contact Akzo Nobel Polymer Chemicals LLC for specific recommendations regarding suitable materials for use with this product.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory protection
This material is normally handled under nitrogen and closed process conditions. In an emergency where adequate ventilation is not available and conditions could generate fume, mist or aerosol, inhalation must be prevented through the use of NIOSH-approved organic vapor/acid gas respirators with dust, mist and fume filters to reduce potential for exposure. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure/pressure-demand, air-supplied respirator. When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the workshift) to assure breakthrough exposure does not occur.

Skin protection
Skin contact must be prevented through the use of fire-retardant clothing. During sampling, disconnecting lines or opening connections, additional protective outerwear including full-face shield, impervious gloves, aluminized suit, a hard hat, steel toed safety shoes that cover the ankles and chemical safety goggles should also be worn.

Eye protection
Because eye contact with this product may cause severe and possibly permanent damage, chemical goggles and/or a full face shield must be worn whenever handling this product.

Ventilation protection
This material is normally handled under closed process conditions.

Other information
This product should not be used until all personnel handling it have been thoroughly trained. Contact Akzo Nobel Polymer Chemicals LLC, Chicago, IL. Additional information on safety and handling of organometallics is available in the Akzo Nobel Polymer Chemicals LLC brochure on metal alkyls.

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<tr>
<td>WEEL = Workplace Environmental Exposure Limit</td>
<td></td>
</tr>
<tr>
<td>IDLH = Immediate Dangerous to Life and Health</td>
<td></td>
</tr>
</tbody>
</table>

9. PHYSICAL AND CHEMICAL PROPERTIES

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<thead>
<tr>
<th>Appearance and Odor</th>
<th>pH value</th>
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</thead>
<tbody>
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<td>not determined</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Odor threshold (ppm)</th>
<th>Relative vapor density (air=1)</th>
</tr>
</thead>
<tbody>
<tr>
<td>not determined</td>
<td>N/D</td>
</tr>
</tbody>
</table>
### TMG SSG (TRIMETHYLGALLIUM)

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Volatile %</td>
<td>100</td>
</tr>
<tr>
<td>Boiling point/range</td>
<td>132.44 °F 55.80 °C @ 760 mm Hg</td>
</tr>
<tr>
<td>Melting point/range</td>
<td>3.20 °F -16.00 °C</td>
</tr>
<tr>
<td>Cloud point</td>
<td>N/D</td>
</tr>
<tr>
<td>Pour point</td>
<td>not determined</td>
</tr>
<tr>
<td>Flash point</td>
<td>Pyrophoric! (ignites in air.)</td>
</tr>
<tr>
<td>Flash method</td>
<td>N/A</td>
</tr>
<tr>
<td>Autoignition temperature</td>
<td>Ignites spontaneously in air.</td>
</tr>
<tr>
<td>Specific Gravity/Density</td>
<td>1.151 g/mL @ 15 C (59 F)</td>
</tr>
<tr>
<td>Bulk density</td>
<td>Not Applicable</td>
</tr>
<tr>
<td>Other information</td>
<td>No other data available.</td>
</tr>
<tr>
<td>Vapor pressure (mm Hg)</td>
<td>64 mm Hg @ 32 F (0 C)</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>not determined</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Reacts violently</td>
</tr>
<tr>
<td>Solubility in other solvents</td>
<td>Soluble in hydrocarbons</td>
</tr>
<tr>
<td>Partition coefficient</td>
<td>not determined</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>lower: N/D</td>
</tr>
<tr>
<td></td>
<td>upper: N/D</td>
</tr>
</tbody>
</table>

### 10. STABILITY AND REACTIVITY

**Stability**
This product is stable when stored under dry, inert atmosphere and away from heat. Dry nitrogen containing less than 5 ppm oxygen and less than 5 ppm of moisture is recommended. This product is not sensitive to physical impact.

**Incompatibilities**
This product may react violently with air, water, and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react vigorously upon contact with the product.

**Polymerization**
Hazardous polymerization is not expected to occur.

**Decomposition**
Gallium oxide fumes, carbon dioxide and water vapor are the products of complete combustion of this product. Incomplete combustion may produce carbon monoxide.

**Conditions to avoid**
Avoid contact with incompatible material, excessive heat and flames.

### 11. TOXICOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Route</th>
<th>Data available</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral LD50</td>
<td>Ingestion toxicity data are not available for this product.</td>
</tr>
<tr>
<td>Dermal LD50</td>
<td>Dermal toxicity data are not available for this product.</td>
</tr>
<tr>
<td>Inhalation LC50</td>
<td>Inhalation toxicity data are not available for this product.</td>
</tr>
<tr>
<td>Skin</td>
<td>Chronic dermal exposure effects for this product are not known. Skin contact with this product will cause severe chemical burns.</td>
</tr>
</tbody>
</table>
Eye

The acute eye effects of this product have not been determined. However, severe chemical and thermal burns can occur and may cause permanent eye damage.

Chronic toxicity/carcinogenicity

Chronic ingestion effects of this product are not known. Ingestion will result in burns of the mouth, throat, esophagus and digestive tract.

Chronic inhalation exposure effects for this product are not known.

The carcinogenic/mutagenic properties of this product are not known.

The reproductive toxicity of this product is not known.

The neurotoxic effects of this product are not known.

Overexposure to this product may affect the skin, eyes and respiratory system.

Other toxicological information

No other toxic effects for this product are known.

12. ECOLOGICAL INFORMATION

Ecotoxicological information

The ecological toxicity of this product is not known.

Bioaccumulation

Chemical fate information on this product is not known.

Other information

Other ecological information on this product is not known.

13. DISPOSAL CONSIDERATIONS

Waste disposal in accordance with regulations

Incineration by controlled feed of air and product is a suitable disposal procedure. Alternately, deactivation can be achieved by diluting the product with hydrocarbon (heptane, etc.) to less than 5 weight percent metal alkyl concentration and treating the hydrocarbon solution with water under a nitrogen atmosphere in a vented and agitated container. Always add the diluted metal alkyl solution to a large excess of water. Allow for the generation of heat and flammable hydrocarbons when treating with water. Conduct water treatment in the absence of air to avoid possible ignition of flammable material. The products from hydrolysis are hydrocarbons and gallium oxide.

Consult RCRA hazardous waste regulations prior to deactivation for potential treatment permitting considerations.

Should the unused product become a waste material, it would meet the characteristics of an ignitable and reactive waste per 40 CFR 261, Subpart C. It is the responsibility of the waste generator to determine if his wastes are hazardous by characteristics or listing.

Note: A technical bulletin (No. 95-90) is available from Akzo Nobel Polymer Chemicals LLC describing details of disposal of laboratory quantities of metal alkyls.

Container disposal

Containers with residual semiconductor grade metal alkyls may be returned to: Akzo Nobel Polymer Chemicals LLC, 730 Battleground Road, Deer Park, Texas 77536. Return shipments of containers are to be in compliance with DOT regulations.
**14. TRANSPORT INFORMATION**

<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Required labels</td>
<td>Primary Label: SPONTANEOUSLY COMBUSTIBLE Subsidiary Label: DANGEROUS WHEN WET</td>
</tr>
<tr>
<td>Environmentally hazardous substance</td>
<td>This product does not contain an environmentally hazardous substance per 49 CFR 172.101, Appendix A.</td>
</tr>
</tbody>
</table>

**15. REGULATORY INFORMATION**

<table>
<thead>
<tr>
<th>Products and/or components listed below are subject to the following:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimethylgallium</td>
</tr>
<tr>
<td>Toxic Subst. Cont. Act -listed</td>
</tr>
<tr>
<td>Non-Domestic Subst.List-Canada</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Hazard classes</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Description</td>
<td></td>
</tr>
<tr>
<td>HMIS Hazard Rating Source</td>
<td>HMIS</td>
</tr>
<tr>
<td>HMIS Health</td>
<td>3</td>
</tr>
<tr>
<td>HMIS Flammability</td>
<td>4</td>
</tr>
<tr>
<td>HMIS Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>WHMIS Hazard Class</td>
<td>B-6, D-2B, E, F</td>
</tr>
</tbody>
</table>

| Other regulatory information | No other regulatory information is available on this product. |

**16. OTHER INFORMATION**

<table>
<thead>
<tr>
<th>Other information</th>
<th>No other information is available.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Created by</td>
<td>PRODUCT SAFETY 914/674-5000</td>
</tr>
</tbody>
</table>

The information in this material safety data sheet should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable as of the date of publication. However, no warranty is made as to the accuracy of and/or sufficiency of such information and/or suggestions as to the merchantability or fitness of the product for any particular purpose, or that any suggested use will not infringe any patent. Nothing in here shall be construed as granting or extending any license under any patent. Buyer must determine for himself, by preliminary tests or otherwise, the suitability of this product for his purposes, including mixing with other products. The information contained herein supersedes all previously issued bulletins on the subject matter covered. If the date on this document is more than three years old, call to make certain that this sheet is current.
1. CHEMICAL PRODUCT AND COMPANY INFORMATION

<table>
<thead>
<tr>
<th>Product name</th>
<th>Chemical description</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMI SSG DISPERSED (TRIMETHYLINDIUM)</td>
<td>Trimethylindium</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>Synonym</th>
<th>Chemical formula</th>
</tr>
</thead>
<tbody>
<tr>
<td>TMI Select Semiconductor Grade</td>
<td>C3 H9 In</td>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>CAS number</th>
<th>Chemical family</th>
</tr>
</thead>
<tbody>
<tr>
<td>3385-78-2</td>
<td>Indium alkyls</td>
</tr>
</tbody>
</table>

Supplier
Akzo Nobel Polymer Chemicals LLC
300 South Riverside Plaza
Chicago, IL 60606
USA

Medical/Handling Emergency
+ 1-914-693-6946
Dobbs Ferry, NY USA

Transportation Emergency
CHEMTREC - USA: 1-800-424-9300
CANUTEC - CANADA: 1-613-996-6666

Product use
Semiconductors

Date of first issue
06-21-2000

2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>Percentage(s)</th>
<th>CAS number</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trimethylindium</td>
<td>100.00</td>
<td>3385-78-2</td>
</tr>
</tbody>
</table>

3. HAZARDS IDENTIFICATION

Emergency overview
White, crystalline solid.
DANGER!
SPONTANEOUSLY COMBUSTIBLE.
MAY CAUSE FLASH FIRE.
CAUSES SEVERE BURNS TO SKIN AND EYES.
HARMFUL IF SWALLOWED OR INHALED.
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition.
In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished.

Health effects
Skin and eye contact are the primary routes of exposure to this product.
Inhalation of the metal alkyl in this product is unlikely due to the highly reactive nature of the metal alkyl with air and its low vapor pressure.
This material will react with moisture in or on the skin to produce thermal and chemical burns.
This product will react with moisture in the eyes to produce severe chemical and thermal burns.
Ingestion will result in burning of the mouth, throat and any part of the gastrointestinal system with which the material comes in contact. Nausea and vomiting may occur.

Carcinogenicity

<table>
<thead>
<tr>
<th>Description</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>IARC</td>
<td>no</td>
</tr>
<tr>
<td>NTP</td>
<td>no</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

**Inhalation**
Remove victim to fresh air while protecting yourself from exposure with an appropriate respirator. Remove any contaminated clothing to prevent further inhalation exposure. Use gloves to avoid contaminating yourself. If not breathing, clear victim's airway and start artificial respiration. Avoid inhaling expired air. Artificial respiration may be supplemented by the use of a bag-mask respirator or manually triggered oxygen supply capable of delivering one liter per second or more. If victim is breathing, supplemental oxygen may be given from a demand-type or continuous-flow inhaler, preferably with a physician's advice. Monitor breathing and pulse. If victim stops breathing, restart artificial respiration. If heart has stopped, begin cardiopulmonary resuscitation immediately. Keep person warm and at rest. Get medical attention immediately.

**Skin**
Immediately, without delay, very gently blot excess chemical from skin while wearing impervious gloves and air tight safety goggles. If victim is wearing air tight safety goggles, do not remove them. Take care not to contaminate the victim's healthy skin and eyes. Wash all affected areas with plenty of water for at least 15 minutes. Do not break open blisters or remove skin. If clothing is stuck to the skin after flushing with water, do not remove it. Do not attempt to neutralize with chemical agents. Wash or discard contaminated clothing and shoes. Obtain medical advice immediately.

**Eye**
Immediately flush eyes with large quantities of running water for a minimum of 15 minutes. If the victim is wearing contact lenses, remove them. Take care not to contaminate the victim's healthy skin and eyes. Hold the eyelids apart during the flushing to ensure rinsing of the entire surface of the eye and lids. DO NOT let victim rub eye(s). Do not attempt to neutralize with chemical agents. Get medical attention immediately. Oils or ointments should not be used at this time. Continue flushing for an additional 15 minutes if a physician is not immediately available.

**Ingestion**
Do NOT induce vomiting. Call a physician or a poison control center immediately. Give victim plenty of water to drink. Never give anything by mouth to an unconscious or convulsing person. Get medical attention immediately.

**Note to physician**
There are no data available that address medical conditions that are generally recognized as being aggravated by exposure to this product.

Attending physician should treat exposed patients symptomatically. Chemical burns on the skin should be treated as thermal burns. Flush eyes with buffered or plain irrigating solutions. If any ulceration or conjunctival injury is present, have an ophthalmologist examine the patient.

5. FIRE-FIGHTING MEASURES

**Flash point**
Pyrophoric! (ignites in air.)

**Autoignition temperature**
Ignites spontaneously in air.

**Flash Method**
N/A

**Explosion limits**
lower: N/D
upper: N/D

**Extinguishing media**
THE MOST EFFECTIVE FIRE EXTINGUISHING AGENT IS DRY CHEMICAL POWDER PRESSURIZED WITH NITROGEN. Vermiculite or dry sand may also be used. CAUTION: REIGNITION MAY OCCUR. DO NOT USE FOAM, WATER (except as explained below), CARBON TETRACHLORIDE OR CHLOROBROMOMETHANE extinguishing agents as product either reacts violently or liberates toxic fumes and vapors on contact with these agents.
Fire fighting procedures
Protecting against fire by strict adherence to safe operating procedures and proper equipment are the best ways to minimize the possibility of fire damage. Immediate action should be taken to confine the fire. All lines and equipment which could contribute to the fire should be shut off. Standard fireman's bunker gear is recommended for fighting metal alkyl fires. If the fire cannot be controlled with extinguishing agents, keep a safe distance, protect adjacent property and allow burn until consumed. Human exposure must be prevented and nonessential personnel evacuated from the immediate area. Breathing vapors from metal alkyl/hydrocarbon fires should be avoided by using proper respiratory equipment. A NIOSH approved, positive-pressure/pressure demand, air-supplied, full-face respirator should be used.

Fire and explosion hazards
Metal alkyls are pyrophoric. The metal alkyl reacts spontaneously with air and/or moisture resulting in ignition. In case of fire, reignition of the metal alkyl may occur after the fire has been extinguished. This material reacts with air, water and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react upon contact with this product. Do not cut, grind, drill or weld on or near the container (even empty) of this product because an explosion may result. Keep away from heat, sparks and flame.

Hazardous products of combustion
Carbon monoxide, carbon dioxide, and indium oxide fumes.

NFPA ratings

<table>
<thead>
<tr>
<th>Hazard</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>Health</td>
<td>3</td>
</tr>
<tr>
<td>Flammability</td>
<td>4</td>
</tr>
<tr>
<td>Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>Other</td>
<td>-W</td>
</tr>
</tbody>
</table>

6. ACCIDENTAL RELEASE MEASURES

Methods for cleaning up
Appropriate personal protective equipment (PPE) should be worn while working with spilled material. Block off source of spill. Spilled material will likely give off smoke and fumes. Ignition may occur immediately. Spill may be washed away cautiously with large quantities of water. Use water spray to reduce vapors. CAUTION: Water may cause ignition/ reignition to occur. Dike water for later disposal. Do not allow contaminated water to enter waterways.

7. HANDLING AND STORAGE

Handling
Electrically grounded tanks and containers should always be used as should non-sparking, electrically grounded hand tools and appliances. Ground or bond to ground all vessels when transferring to prevent the accumulation of static electricity. See National Electric Code.

Storage
Store under an inert atmosphere. Dry nitrogen is a suitable inert gas. Containers should be stored in a cool, well-ventilated area away from flammable materials and sources of heat. Exercise due caution to prevent damage to or leakage from the container. Refrigerate to prevent product agglomeration.

Maximum storage temperature
not determined
See Section 8 - STORAGE.

General comments
Under inert conditions the product is not corrosive to metals commonly used in construction. Some plastics and elastomers may be attacked. Contact Akzo Nobel Polymer Chemicals LLC for specific recommendations regarding suitable materials for use with this product.
8. EXPOSURE CONTROLS/PERSONAL PROTECTION

**Respiratory protection**
This material is normally handled under nitrogen and closed process conditions. In an emergency where adequate ventilation is not available and conditions could generate fume, mist or aerosol, inhalation must be prevented through the use of NIOSH-approved organic vapor/acid gas respirators with dust, mist and fume filters to reduce potential for exposure. Where exposure potential necessitates a higher level of protection, use a NIOSH-approved, positive-pressure/pressure-demand, air-supplied respirator. When using respirator cartridges or canisters, they must be changed frequently (following each use or at the end of the workshift) to assure breakthrough exposure does not occur.

**Skin protection**
Skin contact must be prevented through the use of fire-retardant clothing. During sampling, disconnecting lines or opening connections, additional protective outerwear including full-face shield, impervious gloves, aluminized suit, a hard hat, steel toed safety shoes that cover the ankles and chemical safety goggles should also be worn.

**Eye protection**
Because eye contact with this product may cause severe and possibly permanent damage, chemical goggles and/or a full face shield must be worn whenever handling this product.

**Ventilation protection**
This material is normally handled under closed process conditions.

**Other information**
This product should not be used until all personnel handling it have been thoroughly trained. Contact Akzo Nobel Polymer Chemicals LLC, Chicago, IL. Additional information on safety and handling of organometallics is available in the Akzo Nobel Polymer Chemicals LLC brochure on metal alkyls.

During the development of safe handling procedures, consideration should be given to the need for cleaning of equipment and piping systems to render them nonhazardous before maintenance and repair activities are performed. Waste resulting from these procedures should be handled in an environmentally safe manner.

All food and smoking materials should be kept in a separate area away from the storage/use location. Eating, drinking and smoking should be prohibited in areas where there is a potential for exposure to this material.

Before eating, hands and face should be thoroughly washed.

Safety showers, with quick opening valves which stay open, and eye wash fountains, or other means of washing the eyes with a gentle flow of cool to tepid tap water, should be readily available in all areas where this material is handled or stored. Water should be supplied through insulated and heat-traced lines to prevent freezeups in cold weather.

**Applicable exposure limits**
Other than any exposure limits which may be displayed in Section 8, there are no other known exposure limits applicable to this product.

<table>
<thead>
<tr>
<th>Agency</th>
<th>Value/Unit of measurement</th>
</tr>
</thead>
<tbody>
<tr>
<td>PEL</td>
<td>Permissible Exposure Limit</td>
</tr>
<tr>
<td>TLV</td>
<td>Threshold Limit Value</td>
</tr>
<tr>
<td>TWA</td>
<td>Time Weighted Average</td>
</tr>
<tr>
<td>STEL</td>
<td>Short Term Exposure Limit</td>
</tr>
<tr>
<td>CEIL</td>
<td>Ceiling Exposure Limit</td>
</tr>
<tr>
<td>REL</td>
<td>Recommended Exposure Limit</td>
</tr>
<tr>
<td>WEEL</td>
<td>Workplace Environmental Exposure Limit</td>
</tr>
<tr>
<td>IDLH</td>
<td>Immediate Dangerous to Life and Health</td>
</tr>
</tbody>
</table>

9. PHYSICAL AND CHEMICAL PROPERTIES

**Appearance and Odor**
White, crystalline solid.

**pH value**
Not determined

**Odor threshold (ppm)**
Not determined

**Relative vapor density (air=1)**
N/D
10. STABILITY AND REACTIVITY

Stability
This product is stable when stored under dry, inert atmosphere and away from heat. Dry nitrogen containing less than 5 ppm oxygen and less than 5 ppm of moisture. This product is not sensitive to physical impact.

Caution! Thermal stability tests have shown that trimethylindium undergoes exothermic decomposition starting at about 120 °C (248 °F) and becoming self-sustained at temperatures above 275 °C (527 °F). It is recommended that trimethylindium not be heated above its melting point of 88 °C (190.4 °F) for extended periods and not above 100 °C (212 °F) at any time.

Incompatibilities
This product may react violently with air, water, and compounds containing active hydrogen such as alcohols and acids. Compounds containing oxygen or organic halide may react vigorously upon contact with the product.

Polymerization
Hazardous polymerization is not expected to occur.

Decomposition
Indium oxide fumes, carbon dioxide and water vapor are the products of complete combustion of this product. Incomplete combustion may produce carbon monoxide.

Conditions to avoid
Avoid contact with incompatible material, excessive heat and flames.

11. TOXICOLOGICAL INFORMATION

Oral LD50
Ingestion toxicity data are not available for this product.

Dermal LD50
Dermal toxicity data are not available for this product.

Inhalation LC50
Inhalation toxicity data are not available for this product.
Skin
Chronic dermal exposure effects for this product are not known. Skin contact with this product will cause severe chemical burns.

Eye
The acute eye effects of this product have not been determined. However, severe chemical and thermal burns can occur and may cause permanent eye damage.

Chronic toxicity/carcinogenicity
Chronic ingestion effects of this product are not known. Ingestion will result in burns of the mouth, throat, esophagus and digestive tract.

Chronic inhalation exposure effects for this product are not known.

The carcinogenic/mutagenic properties of this product are not known.

The reproductive toxicity of this product is not known.

The neurotoxic effects of this product are not known.

Overexposure to this product may affect the skin, eyes and respiratory system.

Other toxicological information
No other toxic effects for this product are known.

12. ECOLOGICAL INFORMATION

Ecotoxicological information
The ecological toxicity of this product is not known.

Bioaccumulation
Chemical fate information on this product is not known.

Other information
Other ecological information on this product is not known.

13. DISPOSAL CONSIDERATIONS

Waste disposal in accordance with regulations
Deactivation can be achieved by dissolving the product in toluene to less than 5 weight percent metal alkyl concentration and treating the hydrocarbon solution with water under a nitrogen atmosphere in a and agitated container. Always add the diluted metal alkyl solution to a large excess of water. Allow for the generation of heat and flammable hydrocarbons when treating with water. Conduct water treatment in the absence of air to avoid possible ignition of flammable material. The products from hydrolysis are hydrocarbons and indium oxide.

Consult RCRA hazardous waste regulations prior to deactivation for potential treatment permitting considerations.

Should the unused product become a waste material, it would meet the characteristics of an ignitable and reactive waste per 40 CFR 261, Subpart C. It is the responsibility of the waste generator to determine if his wastes are hazardous by characteristics or listing. Note: A technical bulletin (No. 95-90) is available from Akzo Nobel Polymer Chemicals LLC describing details of disposal of laboratory quantities of metal alkyls.

Container disposal
Containers with residual semiconductor grade metal alkyls may be returned to: Akzo Nobel Polymer Chemicals LLC, 730 Battleground Road, Deer Park, Texas 77536. Return shipments of containers are to be in compliance with DOT regulations.
14. TRANSPORT INFORMATION

<table>
<thead>
<tr>
<th><strong>Shipping description</strong></th>
<th>#METAL ALKYLS, WATER-REACTIVE, N.O.S. (TRIMETHYLINDIUM) 4.2, UN2003, PG I NORTH AMERICAN EMERGENCY RESPONSE GUIDE NO. 135 ICAO: FORBIDDEN IMO: UN2003</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Required labels</strong></td>
<td>Primary Label: SPONTANEOUSLY COMBUSTIBLE Subsidiary Label: DANGEROUS WHEN WET</td>
</tr>
<tr>
<td><strong>Environmentally hazardous substance</strong></td>
<td>This product does not contain an environmentally hazardous substance per 49 CFR 172.101, Appendix A.</td>
</tr>
</tbody>
</table>

15. REGULATORY INFORMATION

**Products and/or components listed below are subject to the following:**

**Trimethylindium**


**Hazard classes**

<table>
<thead>
<tr>
<th>Description</th>
<th>Applicable</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMIS Hazard Rating Source</td>
<td>HMIS</td>
</tr>
<tr>
<td>HMIS Health</td>
<td>3</td>
</tr>
<tr>
<td>HMIS Flammability</td>
<td>4</td>
</tr>
<tr>
<td>HMIS Reactivity</td>
<td>3</td>
</tr>
<tr>
<td>WHMIS Hazard Class</td>
<td>B-6, D-2B, E, F</td>
</tr>
</tbody>
</table>

**Other regulatory information**

No other regulatory information is available on this product.

16. OTHER INFORMATION

**Other information**

No other information is available.

**Created by**

PRODUCT SAFETY 914/674-5000

The information in this material safety data sheet should be provided to all who will use, handle, store, transport or otherwise be exposed to this product. All information concerning this product and/or suggestions for handling and use contained herein are offered in good faith and are believed to be reliable as of the date of publication. However, no warranty is made as to the accuracy of and/or sufficiency of such information and/or suggestions as to the merchantability or fitness of the product for any particular purpose, or that any suggested use will not infringe any patent. Nothing in here shall be construed as granting or extending any license under any patent. Buyer must determine for himself, by preliminary tests or otherwise, the suitability of this product for his purposes, including mixing with other products. The information contained herein supersedes all previously issued bulletins on the subject matter covered. If the date on this document is more than three years old, call to make certain that this sheet is current.
Material Safety Data Sheet
Hydrochloric acid MSDS

Section 1: Chemical Product and Company Identification

<table>
<thead>
<tr>
<th>Product Name: Hydrochloric acid</th>
<th>Contact Information:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog Codes: SLH1462, SLH3154</td>
<td>Sciencelab.com, Inc.</td>
</tr>
<tr>
<td>CAS#: Mixture.</td>
<td>14025 Smith Rd.</td>
</tr>
<tr>
<td>RTECS: MW4025000</td>
<td>Houston, Texas 77396</td>
</tr>
<tr>
<td>TSCA: TSCA 8(b) inventory: Hydrochloric acid</td>
<td>US Sales: 1-800-901-7247</td>
</tr>
<tr>
<td>CI#: Not applicable.</td>
<td>International Sales: 1-281-441-4400</td>
</tr>
<tr>
<td>Synonym: Hydrochloric Acid; Muriatic Acid</td>
<td>Order Online: ScienceLab.com</td>
</tr>
<tr>
<td>Chemical Name: Not applicable.</td>
<td>CHEMTREC (24HR Emergency Telephone), call:</td>
</tr>
<tr>
<td>Chemical Formula: Not applicable.</td>
<td>1-800-424-9300</td>
</tr>
<tr>
<td></td>
<td>International CHEMTREC, call: 1-703-527-3887</td>
</tr>
<tr>
<td></td>
<td>For non-emergency assistance, call: 1-281-441-4400</td>
</tr>
</tbody>
</table>

Section 2: Composition and Information on Ingredients

<table>
<thead>
<tr>
<th>Composition:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Name</td>
</tr>
<tr>
<td>Hydrogen chloride</td>
</tr>
<tr>
<td>Water</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: Hydrogen chloride: GAS (LC50): Acute: 4701 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Non-corrosive for lungs. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth. Repeated or prolonged exposure to the substance can produce target
organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

**Eye Contact:**
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Serious Ingestion:** Not available.

Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** of metals

**Explosion Hazards in Presence of Various Substances:** Non-explosive in presence of open flames and sparks, of shocks.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**
Non combustible. Calcium carbide reacts with hydrogen chloride gas with incandescence. Uranium phosphide reacts with hydrochloric acid to release spontaneously flammable phosphine. Rubidium acetylene carbides burns with slightly warm hydrochloric acid. Lithium silicide in contact with hydrogen chloride becomes incandescent. When dilute hydrochloric acid is used, gas spontaneously flammable in air is evolved. Magnesium boride treated with concentrated hydrochloric acid produces spontaneously flammable gas. Cesium acetylene carbide burns hydrogen chloride gas. Cesium carbide ignites in contact with hydrochloric acid unless acid is dilute. Reacts with most metals to produce flammable Hydrodgen gas.

**Special Remarks on Explosion Hazards:**
Hydrogen chloride in contact with the following can cause an explosion, ignition on contact, or other violent/vigorous reaction: Acetic anhydride AgClO + CCl4 Alcohols + hydrogen cyanide, Aluminum Aluminum-titanium alloys (with HCl vapor), 2-Amino ethanol, Ammonium hydroxide, Calcium carbide Ca3P2 Chlorine + dinitroanilines (evolves gas), Chlorosulfonic acid Cesium carbide Cesium acetylene carbide, 1,1-Difluoroethylene Ethylene diamine Ethylene imine, Fluorine, HClO4 Hexalithium disilicide H2SO4 Metal acetylides or carbides, Magnesium boride, Mercuric sulfate, Oleum, Potassium permanganate, beta-Propiolactone Propylene oxide Rubidium carbide, Rubidium, acetylene carbide Sodium (with aqueous HCl), Sodium hydroxide Sodium tetraselenium, Sulfonic acid, Tetraselenium tetranitride, U3P4, Vinyl acetate. Silver perchlorate with carbon tetrachloride in the presence of hydrochloric acid produces trichloromethyl perchlorate which detonates at 40 deg. C.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up. Keep container dry. Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, organic materials, metals, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
CEIL: 5 (ppm) from OSHA (PEL) [United States] CEIL: 7 (mg/m3) from OSHA (PEL) [United States] CEIL: 5 from NIOSH CEIL: 7 (mg/m3) from NIOSH TWA: 1 STEL: 5 (ppm) [United Kingdom (UK)] TWA: 2 STEL: 8 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.
**Odor:** Pungent. Irritating (Strong.)  
**Taste:** Not available.  
**Molecular Weight:** Not applicable.  
**Color:** Colorless to light yellow.  
**pH (1% soln/water):** Acidic.  

**Boiling Point:**  
108.58°C @ 760 mm Hg (for 20.22% HCl in water)  
83°C @ 760 mm Hg (for 31% HCl in water)  
50.5°C (for 37% HCl in water)  

**Melting Point:**  
-62.25°C (-80°F) (20.69% HCl in water)  
-46.2°C (31.24% HCl in water)  
-25.4°C (39.17% HCl in water)  

**Critical Temperature:** Not available.  
**Specific Gravity:**  
1.1 - 1.19 (Water = 1)  
1.10 (20% and 22% HCl solutions)  
1.12 (24% HCl solution)  
1.15 (29.57% HCl solution)  
1.16 (32% HCl solution)  
1.19 (37% and 38% HCl solutions)  

**Vapor Pressure:** 16 kPa (@ 20°C) average  
**Vapor Density:** 1.267 (Air = 1)  
**Volatility:** Not available.  
**Odor Threshold:** 0.25 to 10 ppm  
**Water/Oil Dist. Coeff.:** Not available.  
**Ionicity (in Water):** Not available.  
**Dispersion Properties:** See solubility in water, diethyl ether.  
**Solubility:** Soluble in cold water, hot water, diethyl ether.

### Section 10: Stability and Reactivity Data

**Stability:** The product is stable.  
**Instability Temperature:** Not available.  
**Conditions of Instability:** Incompatible materials, water  
**Incompatibility with various substances:**  
Highly reactive with metals. Reactive with oxidizing agents, organic materials, alkalis, water.  
**Corrosivity:**  
Extremely corrosive in presence of aluminum, of copper, of stainless steel(304), of stainless steel(316). Non-corrosive in presence of glass.  
**Special Remarks on Reactivity:**  
Reacts with water especially when water is added to the product. Absorption of gaseous hydrogen chloride on mercuric sulfate becomes violent @ 125 deg. C. Sodium reacts very violently with gaseous hydrogen chloride. Calcium phosphate and hydrochloric acid undergo very energetic reaction. It reacts with oxidizers releasing chlorine gas. Incompatible with, alkali metals, carbides, borides, metal oxides, vinyl acetate, acetylides, sulphides, phosphides, cyanides, carbonates. Reacts with most metals to produce flammable Hydrogen gas. Reacts violently (moderate reaction with heat of evolution) with water especially when water is added to the product. Isolate hydrogen chloride from heat, direct sunlight, alkalies (reacts vigorously), organic materials, and oxidizers (especially nitric acid and chlorates), amines, metals, copper and alloys (e.g. brass), hydroxides, zinc (galvanized materials), lithium silicide (incandescence), sulfuric acid (increase in temperature and pressure) Hydrogen chloride gas is emitted when this product is in contact with sulfuric acid. Adsorption of Hydrochloric Acid onto silicon dioxide results in exothermal reaction. Hydrogen chloride causes aldehydes and epoxides to violently polymerize. Hydrogen chloride or Hydrochloric Acid in contact with the following can cause explosion or ignition on contact or  

**Special Remarks on Corrosivity:**
Highly corrosive. Incompatible with copper and copper alloys. It attacks nearly all metals (mercury, gold, platinium, tantalum, silver, and certain alloys are exceptions). It is one of the most corrosive of the nonoxidizing acids in contact with copper alloys. No corrosivity data on zinc, steel. Severe Corrosive effect on brass and bronze

Polymerization: Will not occur.

### Section 11: Toxicological Information

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**
Acute oral toxicity (LD50): 900 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 1108 ppm, 1 hours [Mouse]. Acute toxicity of the vapor (LC50): 3124 ppm, 1 hours [Rat].

**Chronic Effects on Humans:**
CARCINOGENIC EFFECTS: Classified 3 (Not classifiable for human.) by IARC [Hydrochloric acid]. May cause damage to the following organs: kidneys, liver, mucous membranes, upper respiratory tract, skin, eyes, Circulatory System, teeth.

**Other Toxic Effects on Humans:**
Very hazardous in case of skin contact (corrosive, irritant, permeator), of ingestion, . Hazardous in case of eye contact (corrosive), of inhalation (lung corrosive).

**Special Remarks on Toxicity to Animals:**
Lowest Published Lethal Doses (LDL/LCL) LDL [Man] - Route: Oral; 2857 ug/kg LCL [Human] - Route: Inhalation; Dose: 1300 ppm/30M LDL [Rabbit] - Route: Inhalation; Dose: 4413 ppm/30M

**Special Remarks on Chronic Effects on Humans:**
May cause adverse reproductive effects (fetotoxicity). May affect genetic material.

**Special Remarks on other Toxic Effects on Humans:**
Acute Potential Health Effects: Skin: Corrosive. Causes severe skin irritation and burns. Eyes: Corrosive. Causes severe eye irritation/conjunctivitis, burns, corneal necrosis. Inhalation: May be fatal if inhaled. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract. Inhalation of hydrochloric acid fumes produces nose, throat, and laryngeal burning, and irritation, pain and inflammation, coughing, sneezing, choking sensation, hoarseness, laryngeal spasms, upper respiratory tract edema, chest pains, as well as headache, and palpitations. Inhalation of high concentrations can result in corrosive burns, necrosis of bronchial epithelium, constriction of the larynx and bronchi, nasospetal perforation, glottal closure, occur, particularly if exposure is prolonged. May affect the liver. Ingestion: May be fatal if swallowed. Causes irritation and burning, ulceration, or perforation of the gastrointestinal tract and resultant peritonitis, gastric hemorrhage and infection. Can also cause nausea, vomiting (with "coffee ground" emesis), diarrhea, thirst, difficulty swallowing, salivation, chills, fever, uneasiness, shock, strictures and stenosis (esophageal, gastric, pyloric). May affect behavior (excitement), the cardiovascular system (weak rapid pulse, tachycardia), respiration (shallow respiration), and urinary system (kidneys- renal failure, nephritis). Acute exposure via inhalation or ingestion can also cause erosion of tooth enamel. Chronic Potential Health Effects: dyspnea, bronchitis. Chemical pneumonitis and pulmonary edema can also

### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material  
**Identification:** Hydrochloric acid, solution UNNA: 1789 PG: II  
**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

#### Federal and State Regulations:
- Connecticut hazardous material survey.  
- Hydrochloric acid Illinois toxic substances disclosure to employee act: Hydrochloric acid  
- Illinois chemical safety act: Hydrochloric acid  
- New York release reporting list: Hydrochloric acid  
- Rhode Island RTK hazardous substances: Hydrochloric acid  
- Pennsylvania RTK: Hydrochloric acid  
- Minnesota: Hydrochloric acid Massachusetts RTK: Hydrochloric acid Massachusetts spill list: Hydrochloric acid  
- New Jersey: Hydrochloric acid  
- New Jersey spill list: Hydrochloric acid  
- Rhode Island RTK: Hydrochloric acid  
- California Director's List of Hazardous Substances: Hydrochloric acid  
- TSCA 8(b) inventory: Hydrochloric acid  
- TSCA 4(a) proposed test rules: Hydrochloric acid  
- SARA 302/304/311/312 extremely hazardous substances: Hydrochloric acid  
- SARA 313 toxic chemical notification and release reporting: Hydrochloric acid  
- CERCLA: Hazardous substances: Hydrochloric acid  
- 5000 lbs. (2268 kg)

#### Other Regulations:
- EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

#### Other Classifications:
- **WHMIS (Canada):**  
  CLASS D-2A: Material causing other toxic effects (VERY TOXIC).  
  CLASS E: Corrosive liquid.
- **DSCL (EEC):**  
  R34- Causes burns.  
  R37- Irritating to respiratory system.  
  S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.  
  S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
- **HMIS (U.S.A.):**  
  - Health Hazard: 3  
  - Fire Hazard: 0  
  - Reactivity: 1  
  - **Personal Protection:**  
  - **National Fire Protection Association (U.S.A.):**  
    - Health: 3  
    - Flammability: 0  
    - Reactivity: 1  
    - **Specific hazard:**
- **Protective Equipment:**  
  Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

### Section 16: Other Information
References:

Other Special Considerations: Not available.

Created: 10/09/2005 05:45 PM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Hydrogen Peroxide 30% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Hydrogen Peroxide 30%

Catalog Codes: SLH1552

CAS#: Mixture.

RTECS: Not applicable.

TSCA: TSCA 8(b) inventory: Water; Hydrogen Peroxide

CI#: Not applicable.

Synonym: Hydrogen Peroxide 30%

Chemical Name: Not applicable.

Chemical Formula: Not applicable.

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: 1-800-901-7247
International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>70</td>
</tr>
<tr>
<td>Hydrogen Peroxide</td>
<td>7722-84-1</td>
<td>30</td>
</tr>
</tbody>
</table>


Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant). Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of ingestion. Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to lungs, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage.
Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.
Auto-Ignition Temperature: Not applicable.
Flash Points: Not applicable.
Flammable Limits: Not applicable.
Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: combustible materials

Explosion Hazards in Presence of Various Substances: Slightly explosive in presence of open flames and sparks, of heat, of organic materials, of metals, of acids.

Fire Fighting Media and Instructions:
Fire: Small fires: Use water. Do not use dry chemicals or foams. CO2, or Halon may provide limited control. Large fires: Flood fire area with water from a distance. Move containers from fire area if you can do it without risk. Do not move cargo or vehicle if cargo has been exposed to heat. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. ALWAYS stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed]

Special Remarks on Fire Hazards:
Most cellulose (wood, cotton) materials contain enough catalyst to cause spontaneous ignition with 90% Hydrogen Peroxide. Hydrogen Peroxide is a strong oxidizer. It is not flammable itself, but it can cause spontaneous combustion of flammable materials and continued support of the combustion because it liberates oxygen as it decomposes. Hydrogen peroxide mixed with magnesium and a trace of magnesium dioxide will ignite immediately.

Special Remarks on Explosion Hazards:
Soluble fuels (acetone, ethanol, glycerol) will detonate on a mixture with peroxide over 30% concentration, the violence increasing with concentration. Explosive with acetic acid, acetic anhydride, acetone, alcohols, carboxylic acids, nitrogen containing bases, As2S3, CI2 + KOH, FeS, FeSO4 + 2 methylpyridine + H2SO4, nitric acid, potassium permanganate, P2O5, H2Se, Alcohols + H2SO4, Alcohols + tin chloride, Antimoy trisulfide, chlorosulfonic acid, Aromatic hydrocarbons + trifluoroacetic acid, Azellic acid + sulfuric acid (above 45 C), Benzenesulfonic anhydride, tert-butanol + sulfuric acid, Hydrazine, Sulfuric acid, Sodium iodate, Tetrahydrothiophene, Thiodiglycol, Mercurous oxide, mercuric oxide, Lead dioxide, Lead oxide, Manganese dioxide, Lead sulfide, Gallium + HCl, Ketenes + nitric acid, Iron (II) sulfate + 2-methylpyridine + sulfuric acid, Iron (II) sulfate + nitric acid, + sodium carboxymethylcellulose (when evaporated), Vinyl acetate, trioxane, water + oxygenated compounds (eg: acetaldehyde, acetic acid, acetone, ethanol, formaldehyde, formic acid, methanol, 2-propanol, propionaldehyde), organic compounds. Beware: Many mixtures of hydrogen peroxide and organic materials may not explode upon contact. However, the resulting combination is detonatable either upon catching fire or by impact. EXPLOSION HAZARD: SEVERE, WHEN HIGHLY CONCENTRATED OR PURE H2O2 IS EXPOSED TO HEAT, MECHANICAL IMPACT, OR CAUSED TO DECOMPOSE CATALYTICALLY BY METALS & THEIR SALTS, DUSTS & ALKALIES. ANOTHER SOURCE OF HYDROGEN PEROXIDE EXPLOSIONS IS FROM SEALING THE MATERIAL IN STRONG CONTAINERS. UNDER SUCH CONDITIONS EVEN GRADUAL DECOMPOSITION OF HYDROGEN PEROXIDE TO WATER + 1/2 OXYGEN CAN CAUSE LARGE PRESSURES TO BUILD UP IN THE CONTAINERS WHICH MAY BURST EXPLOSIVELY. Fire or explosion: May explode from friction, heat or contamination. These substances will accelerate burning when involved in a fire. May ignite combustibles (wood, paper, oil, clothing, etc.). Some will react explosively with hydrocarbons (fuels). Containers may explode when heated. Runoff may create fire or explosion hazard. /Hydrogen peroxide, aqueous solution, with not less than 8% but less than 20% Hydrogen peroxide; Hydrogen peroxide, aqueous solution, with not less than 20% but not more than 60% Hydrogen peroxide (stabilized as necessary)/ [QC Reviewed] [U.S. Department of Transportation. 2000 Emergency Response Guidebook. RSPA P 5800.8 Edition. Washington, D.C: U.S. Government Printing Office, 2000,p. G-140] (Hydrogen Peroxide)

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

Large Spill:
Corrosive liquid. Oxidizing material. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material.. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis.

Storage:

Section 8: Exposure Controls/Personal Protection
Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Hydrogen Peroxide TWA: 1 (ppm) from ACGIH (TLV) [United States] TWA: 1 (ppm) from OSHA (PEL) [United States] TWA: 1 STEL: 2 [Canada] TWA: 1.4 (mg/m3) from NIOSH TWA: 1.4 (mg/m3) from OSHA (PEL) [United States] TWA: 1 (ppm) [United Kingdom (UK)] TWA: 1.4 (mg/m3) [United Kingdom (UK)]Consult local authorities for acceptable exposure limits.

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### Section 9: Physical and Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state and appearance</td>
<td>Liquid</td>
</tr>
<tr>
<td>Odor</td>
<td>Odorless</td>
</tr>
<tr>
<td>Taste</td>
<td>Slightly acid. Bitter</td>
</tr>
<tr>
<td>Molecular Weight</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Color</td>
<td>Clear Colorless</td>
</tr>
<tr>
<td>pH (1% soln/water)</td>
<td>Not available</td>
</tr>
<tr>
<td>Boiling Point</td>
<td>108°C (226.4°F)</td>
</tr>
<tr>
<td>Melting Point</td>
<td>-33°C (-27.4°F)</td>
</tr>
<tr>
<td>Critical Temperature</td>
<td>Not available</td>
</tr>
<tr>
<td>Specific Gravity</td>
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</tr>
<tr>
<td>Vapor Pressure</td>
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<td>Odor Threshold</td>
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</tr>
<tr>
<td>Water/Oil Dist. Coeff.</td>
<td>Not available</td>
</tr>
<tr>
<td>Ionicity (in Water)</td>
<td>Not available</td>
</tr>
<tr>
<td>Dispersion Properties</td>
<td>See solubility in water, diethyl ether.</td>
</tr>
<tr>
<td>Solubility</td>
<td>Easily soluble in cold water. Soluble in diethyl ether.</td>
</tr>
</tbody>
</table>

### Section 10: Stability and Reactivity Data

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability</td>
<td>The product is stable. It contains a stabilizer.</td>
</tr>
<tr>
<td>Instability Temperature</td>
<td>Not available</td>
</tr>
<tr>
<td>Conditions of Instability</td>
<td>Excess heat, incompatible materials</td>
</tr>
<tr>
<td>Incompatibility with various substances</td>
<td>Reactive with reducing agents, combustible materials, organic materials, metals, acids, alkalis.</td>
</tr>
</tbody>
</table>
**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**
Light sensitive. Incompatible with reducing materials, ethers (dioxane, furfuran, tetrahydrofuran), oxidizing materials, Metals (e.g. potassium, sodium lithium, iron, copper, brass, bronze, chromium, zinc, lead, silver, nickel), metal oxides (e.g. cobalt oxide, iron oxide, lead oxide, lead hydroxide, manganese oxide), metal salts (e.g. calcium permanganate, salts of iron), manganese, asbestos, vanadium, platinum, tungsten, molybdenum, triethylamine, palladium, sodium pyrophosphate, carboxylic acids, cyclopentadiene, formic acid, rust, ketones, sodium carbonate, alcohols, sodium borate, aniline, mercurous chloride, rust, nitric acid, sodium pyrophosphate, hexavalent chromium compounds, tetrahydrofuran, sodium fluoride organic matter, potassium permanganate, urea, chlorosulfonic acid, manganese dioxide, hydrogen selenide, charcoal, coal, sodium borate, alkalies, cyclopentadiene, glycerine, cyanides (potassium, cyanide, sodium cyanide), nitrogen compounds. Caused to decompose catalytically by metals (in order of decreasing effectiveness): Osmium, Palladium, Platinum, Iridium, Gold, Silver, Manganese, Cobalt, Copper, Lead. Concentrated hydrogen peroxide may decompose violently or explosively in contact with iron, copper, chromium, and most other metals and their salts, and dust. (Hydrogen Peroxide)

**Special Remarks on Corrosivity:** Not available.

**Polymerization:** Will not occur.

---

**Section 11: Toxicological Information**

**Routes of Entry:** Absorbed through skin. Eye contact.

**Toxicity to Animals:**
Acute oral toxicity (LD50): 6667 mg/kg (Mouse) (Calculated value for the mixture). Acute dermal toxicity (LD50): 6667 mg/kg (pig) (Calculated value for the mixture).

**Chronic Effects on Humans:**
CARCINOGENIC EFFECTS: Classified A3 (Proven for animal.) by ACGIH [Hydrogen Peroxide]. Classified 3 (Not classifiable for human.) by IARC [Hydrogen Peroxide]. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. [Hydrogen Peroxide]. Mutagenic for bacteria and/or yeast. [Hydrogen Peroxide]. Contains material which may cause damage to the following organs: blood, upper respiratory tract, skin, eyes, central nervous system (CNS).

**Other Toxic Effects on Humans:**
Very hazardous in case of skin contact (irritant). Hazardous in case of skin contact (corrosive), of eye contact (corrosive), of ingestion, of inhalation (lung corrosive).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**
May cause cancer and may affect genetic material based on animal data. May be tumorigenic. (Hydrogen Peroxide)

**Special Remarks on other Toxic Effects on Humans:**
Acute Potential Health Effects: Skin: Causes severe skin irritation and possible burns. Absorption into skin may affect behavior/central nervous system (tremor, ataxia, convulsions), respiration (dyspnea, pulmonary emboli), brain. Eyes: Causes severe eye irritation, superficial clouding, corneal edema, and may cause burns. Inhalation: Causes respiratory tract irritation with coughing, lacrimation. May cause chemical burns to the respiratory tract. May affect behavior/central nervous system (insomnia, headache, ataxia, nervous tremors with numb extremities) and may cause ulceration of nasal tissue, and, chemical pneumonia, unconsciousness, and possible death. At high concentrations, respiratory effects may include acute lung damage, and delayed pulmonary edema. May affect blood. Ingestion: Causes gastrointestinal tract irritation with nausea, vomiting, hypermotility, and diarrhea. Causes gastrointestinal tract burns. May affect cardiovascular system and cause vascular collapse and damage. May affect blood (change in leukocyte count, pigmented or nucleated red blood cells). May cause difficulty in swallowing, stomach distension and possible cerebral swelling. May affect behavior/central nervous system (tetany, excitement). Chronic Potential Health Effects: Prolonged or repeated skin contact may cause dermatitis. Repeated contact may also cause corneal damage. Prolonged or repeated ingestion may affect metabolism (weight loss). Prolonged or repeated inhalation may affect respiration, blood. (Hydrogen Peroxide)

---

**Section 12: Ecological Information**

**Ecotoxicity:** Not available.
BOD5 and COD: Not available.

Products of Biodegradation: Possibly hazardous short/long term degradation products are to be expected.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

---

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

---

Section 14: Transport Information

DOT Classification: CLASS 5.1: Oxidizing material.


Special Provisions for Transport: Not available.

---

Section 15: Other Regulatory Information

Federal and State Regulations:


Other Classifications:

WHMIS (Canada):
CLASS C: Oxidizing material. CLASS E: Corrosive liquid. CLASS F: Dangerously reactive material.

DSCL (EEC):

HMIS (U.S.A.):

Health Hazard: 3
Fire Hazard: 0
Reactivity: 1

Personal Protection:

National Fire Protection Association (U.S.A.):

Health: 2
Flammability: 0
Reactivity: 1

Specific hazard:

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.
Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 05:46 PM

Last Updated: 05/21/2013 12:00 PM

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Material Safety Data Sheet
Isopropyl alcohol MSDS

Section 1: Chemical Product and Company Identification

<table>
<thead>
<tr>
<th>Product Name: Isopropyl alcohol</th>
</tr>
</thead>
<tbody>
<tr>
<td>Catalog Codes: SLI1153, SLI1579, SLI1906, SLI1246, SLI1432</td>
</tr>
<tr>
<td>CAS#: 67-63-0</td>
</tr>
<tr>
<td>RTECS: NT8050000</td>
</tr>
<tr>
<td>TSCA: TSCA 8(b) inventory: Isopropyl alcohol</td>
</tr>
<tr>
<td>CI#: Not available.</td>
</tr>
<tr>
<td>Synonym: 2-Propanol</td>
</tr>
<tr>
<td>Chemical Name: isopropanol</td>
</tr>
<tr>
<td>Chemical Formula: C3-H8-O</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contact Information:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sciencelab.com, Inc.</td>
</tr>
<tr>
<td>14025 Smith Rd.</td>
</tr>
<tr>
<td>Houston, Texas 77396</td>
</tr>
<tr>
<td>US Sales: 1-800-901-7247</td>
</tr>
<tr>
<td>International Sales: 1-281-441-4400</td>
</tr>
<tr>
<td>Order Online: ScienceLab.com</td>
</tr>
<tr>
<td>CHEMTREC (24HR Emergency Telephone), call:</td>
</tr>
<tr>
<td>1-800-424-9300</td>
</tr>
<tr>
<td>International CHEMTREC, call: 1-703-527-3887</td>
</tr>
<tr>
<td>For non-emergency assistance, call: 1-281-441-4400</td>
</tr>
</tbody>
</table>

Section 2: Composition and Information on Ingredients

Composition:

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Isopropyl alcohol</td>
<td>67-63-0</td>
<td>100</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: Isopropyl alcohol: ORAL (LD50): Acute: 5045 mg/kg [Rat]. 3600 mg/kg [Mouse]. 6410 mg/kg [Rabbit]. DERMAL (LD50): Acute: 12800 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer, permeator).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (sensitizer). CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE]. The substance may be toxic to kidneys, liver, skin, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures
Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention.

Skin Contact:
Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops. Cold water may be used.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

| Flammability of the Product: Flammable. |
| Auto-Ignition Temperature: 399°C (750.2°F) |
| Flash Points: CLOSED CUP: 11.667°C (53°F) - 12.778 deg. C (55 deg. F) (TAG) |
| Flammable Limits: LOWER: 2% UPPER: 12.7% |
| Products of Combustion: These products are carbon oxides (CO, CO2). |

Fire Hazards in Presence of Various Substances:

 Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. CAUTION: MAY BURN WITH NEAR INVISIBLE FLAME. Hydrogen peroxide sharply reduces the autoignition temperature of Isopropyl alcohol. After a delay, Isopropyl alcohol ignites on contact with dioxygenyl tetrafluoroborate, chromium trioxide, and potassium tert-butoxide. When heated to decomposition it emits acrid smoke and fumes.

Special Remarks on Explosion Hazards:
Secondary alcohols are readily autooxidized in contact with oxygen or air, forming ketones and hydrogen peroxide. It can become potentially explosive. It reacts with oxygen to form dangerously unstable peroxides which can concentrate and explode during distillation or evaporation. The presence of 2-butane increases the reaction rate for peroxide formation. Explosive in the form of vapor when exposed to heat or flame. May form explosive mixtures with air. Isopropyl alcohol + phosgene forms isopropyl chloroformate and hydrogen chloride. In the presence of iron salts, thermal decomposition can occur, which in some cases can become explosive. A homogeneous mixture of concentrated peroxides + isopropyl alcohol are capable of detonation by shock or heat. Barium perchlorate + isopropyl alcohol gives the highly explosive alkyl perchlorates.
It forms explosive mixtures with trinitromethane and hydrogen peroxide. It produces a violent explosive reaction when heated with aluminum isopropoxide + crotonaldehyde. Mixtures of isopropyl alcohol + nitroform are explosive.

### Section 6: Accidental Release Measures

**Small Spill:**
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container.

**Large Spill:**
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

### Section 7: Handling and Storage

**Precautions:**
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents, acids.

**Storage:**
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

### Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

**Personal Protection in Case of a Large Spill:**
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**
TWA: 983 STEL: 1230 (mg/m3) [Australia] TWA: 200 STEL: 400 (ppm) from ACGIH (TLV) [United States] [1999] TWA: 980 STEL: 1225 (mg/m3) from NIOSH TWA: 400 STEL: 500 (ppm) [United Kingdom (UK)] TWA: 999 STEL: 1259 (mg/m3) [United Kingdom (UK)] TWA: 400 STEL: 500 (ppm) from OSHA (PEL) [United States] TWA: 980 STEL: 1225 (mg/m3) from OSHA (PEL) [United States]Consult local authorities for acceptable exposure limits.

### Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:**
Pleasant. Odor resembling that of a mixture of ethanol and acetone.

**Taste:** Bitter. (Slight.)

**Molecular Weight:** 60.1 g/mole
**Color:** Colorless.

**pH (1% soln/water):** Not available.

**Boiling Point:** 82.5°C (180.5°F)

**Melting Point:** -88.5°C (-127.3°F)

**Critical Temperature:** 235°C (455°F)

**Specific Gravity:** 0.78505 (Water = 1)

**Vapor Pressure:** 4.4 kPa (@ 20°C)

**Vapor Density:** 2.07 (Air = 1)

**Odor Threshold:**
22 ppm (Sittig, 1991) 700 ppm for unadapted panelists (Verschuren, 1983).

**Water/Oil Dist. Coeff.:** The product is equally soluble in oil and water; log(oil/water) = 0.1

**Ionicity (in Water):** Not available.

**Dispersion Properties:** See solubility in water, methanol, diethyl ether, n-octanol, acetone.

**Solubility:**
Easily soluble in cold water, hot water, methanol, diethyl ether, n-octanol, acetone. Insoluble in salt solution. Soluble in benzene. Miscible with most organic solvents including alcohol, ethyl alcohol, chloroform.

---

**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Heat, Ignition sources, incompatible materials

**Incompatibility with various substances:** Reactive with oxidizing agents, acids, alkalis.

**Corrosivity:** Non-corrosive in presence of glass.

**Special Remarks on Reactivity:**
Reacts violently with hydrogen + palladium combination, nitroform, oleum, COCl2, aluminum triisopropoxide, oxidants
Incompatible with acetaldehyde, chlorine, ethylene oxide, isocyanates, acids, alkaline earth, alkali metals, caustics, amines, crotonaldehyde, phosgene, ammonia. Isopropyl alcohol reacts with metallic aluminum at high temperatures. Isopropyl alcohol attacks some plastics, rubber, and coatings. Vigorous reaction with sodium dichromate + sulfuric acid.

**Special Remarks on Corrosivity:** May attack some forms of plastic, rubber and coating

**Polymerization:** Will not occur.

---

**Section 11: Toxicological Information**

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation.

**Toxicity to Animals:**
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 3600 mg/kg [Mouse]. Acute dermal toxicity (LD50): 12800 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 16000 8 hours [Rat].

**Chronic Effects on Humans:**
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC.
DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female, Development toxin [POSSIBLE]. May cause damage to the following organs: kidneys, liver, skin, central nervous system (CNS).
**Other Toxic Effects on Humans:**
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, sensitizer, permeator).

**Special Remarks on Toxicity to Animals:** Not available.

**Special Remarks on Chronic Effects on Humans:**
May cause adverse reproductive/teratogenic effects (fertility, toxicity, developmental abnormalities) based on animal studies. Detected in maternal milk in human.

**Special Remarks on other Toxic Effects on Humans:**
Acute Potential Health Effects: Skin: May cause mild skin irritation, and sensitization. Eyes: Can cause eye irritation. Inhalation: Breathing in small amounts of this material during normal handling is not likely to cause harmful effects. However, breathing large amounts may be harmful and may affect the respiratory system and mucous membranes (irritation), behavior and brain (Central nervous system depression - headache, dizziness, drowsiness, stupor, incoordination, unconsciousness, coma and possible death), peripheral nerve and sensation, blood, urinary system, and liver. Ingestion: Swallowing small amounts during normal handling is not likely to cause harmful effects. Swallowing large amounts may be harmful. Swallowing large amounts may cause gastrointestinal tract irritation with nausea, vomiting and diarrhea, abdominal pain. It also may affect the urinary system, cardiovascular system, sense organs, behavior or central nervous system (somnolence, generally depressed activity, irritability, headache, dizziness, drowsiness), liver, and respiratory system (breathing difficulty). Chronic Potential Health Effects: May cause defatting of the skin and dermatitis and allergic reaction. May cause adverse reproductive effects based on animal data (studies).

---

**Section 12: Ecological Information**

**Ecotoxicity:** Ecotoxicity in water (LC50): 100000 mg/l 96 hours [Fathead Minnow]. 64000 mg/l 96 hours [Fathead Minnow].

**BOD5 and COD:** Not available.

**Products of Biodegradation:**
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The product itself and its products of degradation are not toxic.

**Special Remarks on the Products of Biodegradation:** Not available.

---

**Section 13: Disposal Considerations**

**Waste Disposal:**
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

---

**Section 14: Transport Information**

**DOT Classification:** CLASS 3: Flammable liquid.

**Identification:** Isopropyl Alcohol UNNA: 1219 PG: II

**Special Provisions for Transport:** Not available.

---

**Section 15: Other Regulatory Information**

**Federal and State Regulations:**
and S data reporting: Isopropyl alcohol: Effective date: 12/15/86 Sunset Date: 12/15/96 TSCA 12(b) one time export: Isopropyl alcohol SARA 313 toxic chemical notification and release reporting: Isopropyl alcohol

**Other Regulations:**

**Other Classifications:**

**WHMIS (Canada):**
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2B: Material causing other toxic effects (TOXIC).

**DSCL (EEC):**
R11- Highly flammable. R36- Irritating to eyes. S7- Keep container tightly closed. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

**HMIS (U.S.A.):**

- **Health Hazard:** 2
- **Fire Hazard:** 3
- **Reactivity:** 0
- **Personal Protection:** h

**National Fire Protection Association (U.S.A.):**

- **Health:** 1
- **Flammability:** 3
- **Reactivity:** 0
- **Specific hazard:**

**Protective Equipment:**
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

---

**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/09/2005 05:53 PM

**Last Updated:** 05/21/2013 12:00 PM

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Material Safety Data Sheet
Nitric acid, 65% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Nitric acid, 65%
Catalog Codes: SLN2161
CAS#: Mixture.
RTCS: Not applicable.
TSCA: TSCA 8(b) inventory: Water; Nitric acid, fuming
CI#: Not applicable.
Synonym: Nitric Acid, 65%
Chemical Name: Not applicable.
Chemical Formula: Not applicable.

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: 1-800-901-7247
International Sales: 1-281-441-4400
Order Online: ScienceLab.com
CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>35</td>
</tr>
<tr>
<td>Nitric acid, fuming</td>
<td>7697-37-2</td>
<td>65</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: Nitric acid, fuming: VAPOR (LC50): Acute: 244 ppm 0.5 hours [Rat]. 344 ppm 0.5 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, . Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucus membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Prolonged exposure may result in skin burns and ulcerations. Over-exposure by inhalation may cause respiratory irritation. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to lungs, mucous membranes, upper respiratory
tract, skin, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection.

### Section 4: First Aid Measures

**Eye Contact:**
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**
If swallowed, do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** of combustible materials

**Explosion Hazards in Presence of Various Substances:**
Explosive in presence of reducing materials, of organic materials, of metals, of alkalis. Non-explosive in presence of open flames and sparks, of shocks.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**
Flammable in presence of cellulose or other combustible materials. Phosphine, hydrogen sulfide, selenide all ignite when fuming nitric acid is dripped into gas. (Nitric Acid, fuming)

**Special Remarks on Explosion Hazards:**
Reacts explosively with metallic powders, carbides, cyanides, sulfides, alkalis and turpentine. Can react explosively with many reducing agents. Arsine, phosphine, tetraborane all oxidized explosively in presence of nitric acid. Cesium and rubidium
Section 6: Accidental Release Measures

**Small Spill:**
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

**Large Spill:**
Corrosive liquid. Oxidizing material. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Avoid contact with a combustible material (wood, paper, oil, clothing...). Keep substance damp using water spray. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

**Precautions:**
Keep locked up. Keep container dry. Keep away from heat. Keep away from sources of ignition. Keep away from combustible material. Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

**Storage:**

Section 8: Exposure Controls/Personal Protection

**Engineering Controls:**
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

**Personal Protection:**

**Personal Protection in Case of a Large Spill:**
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

**Exposure Limits:**
TWA: 2 STEL: 4 (ppm) from ACGIH (TLV) [United States] TWA: 2 STEL: 4 from OSHA (PEL) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

**Physical state and appearance:** Liquid.

**Odor:** Acrid. Disagreeable and choking. (Strong.)

**Taste:** Not available.
**Section 10: Stability and Reactivity Data**

**Stability:** The product is stable.

**Instability Temperature:** Not available.

**Conditions of Instability:** Incompatible materials

**Incompatibility with various substances:**
Highly reactive with alkalis. Reactive with reducing agents, combustible materials, organic materials, metals, acids.

**Corrosivity:**
Extremely corrosive in presence of aluminum, of copper. Non-corrosive in presence of glass, of stainless steel(304), of stainless steel(316), of brass.

**Special Remarks on Reactivity:**
A strong oxidizer. Reacts violently with alcohol, organic material, turpene, charcoal. Violent reaction with Nitric acid + Acetone and Sulfuric acid. Nitric Acid will react with water or steam to produce heat and toxic, corrosive and flammable vapors. (Nitric acid, fuming)

**Special Remarks on Corrosivity:**
In presence of traces of oxides, it attacks all base metals except aluminum and special chromium steels. It will attack some forms of plastics, rubber, and coatings. No corrosive effect on bronze. No corrosivity data for zinc, and steel

**Polymerization:** Will not occur.

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**Section 11: Toxicological Information**

**Routes of Entry:** Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

**Toxicity to Animals:**
LD50: Not available. LC50: Not available.

**Chronic Effects on Humans:**
Contains material which may cause damage to the following organs: lungs, mucous membranes, upper respiratory tract, skin, eyes, teeth.

**Other Toxic Effects on Humans:**
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion.

**Special Remarks on Toxicity to Animals:** LDL - Lowest Published Lethal Dose [Human] - Route: Oral; Dose: 430 mg/kg (Nitric acid, fuming)

**Special Remarks on Chronic Effects on Humans:**
May cause adverse reproductive effects (effects on newborn and fetotoxicity) based on animal data. (Nitric acid, fuming)

**Special Remarks on other Toxic Effects on Humans:**
Acute Potential Health Effects: Skin: Severely irritates skin. Causes skin burns and may cause deep and penetrating ulcers of the skin with a characteristic yellow to brownish discoloration. May be fatal if absorbed through skin. Eyes: Severely irritates eyes. Causes eye burns. May cause irreversible eye injury. Ingestion: May be fatal if swallowed. Causes serious gastrointestinal tract irritation or burns with nausea, vomiting, severe abdominal pain, and possible "coffee grounds" appearance of the vomitus. May cause perforation of the digestive tract. Inhalation: May be fatal if inhaled. Vapor is extremely hazardous. Vapor may cause nitrous gas poisoning. Effects may be delayed. May cause irritation of the mucous membranes and respiratory tract with burning pain in the nose and throat, coughing, sneezing, wheezing, shortness of breath and pulmonary edema. Other symptoms may include nausea, and vomiting. Chronic Potential Health Effects: Repeated inhalation may produce changes in pulmonary function and/or chronic bronchitis. It may also affect behavior (headache, dizziness, drowsiness, muscle contaction or spasticity, weakness, loss of coordinaton, mental confusion), and urinary system (kidney failure, decreased urinary output after several hours of

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**Section 12: Ecological Information**

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

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**Section 13: Disposal Considerations**

**Waste Disposal:**
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

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**Section 14: Transport Information**

**DOT Classification:** Class 8: Corrosive material

**Identification:** Nitric acid UNNA: 2031 PG: II

**Special Provisions for Transport:** Marine Pollutant

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**Section 15: Other Regulatory Information**

**Federal and State Regulations:**
New York release reporting list: Nitric acid, fuming Rhode Island RTK hazardous substances: Nitric acid, fuming Pennsylvania RTK: Nitric acid, fuming Florida: Nitric acid, fuming Minnesota: Nitric acid, fuming Massachusetts RTK: Nitric acid, fuming
New Jersey: Nitric acid, fuming TSCA 8(b) inventory: Water; Nitric acid, fuming SARA 302/304/311/312 extremely hazardous substances: Nitric acid, fuming SARA 313 toxic chemical notification and release reporting: Nitric acid, fuming 65% CERCLA: Hazardous substances.: Nitric acid, fuming: 1000 lbs. (453.6 kg);


**Other Classifications:**

**WHMIS (Canada):**

**DSCL (EEC):**
R8- Contact with combustible material may cause fire. R35- Causes severe burns. S23- Do not breathe gas/fumes/vapour/spray [***] S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S36- Wear suitable protective clothing. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

**HMIS (U.S.A.):**

- **Health Hazard:** 3
- **Fire Hazard:** 0
- **Reactivity:** 0

**Personal Protection:**

**National Fire Protection Association (U.S.A.):**

- **Health:** 4
- **Flammability:** 0
- **Reactivity:** 0

**Specific hazard:**

**Protective Equipment:**
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

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**Section 16: Other Information**

**References:** Not available.

**Other Special Considerations:** Not available.

**Created:** 10/10/2005 10:59 AM

**Last Updated:** 05/21/2013 12:00 PM

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Material Safety Data Sheet
Phosphoric acid, 85% MSDS

Section 1: Chemical Product and Company Identification

Product Name: Phosphoric acid, 85%
Catalog Codes: SLP5569, SLP4555, SLP1732
CAS#: Mixture.
RTECS: Not applicable.
TSCA: TSCA 8(b) inventory: Phosphoric Acid; Water
CI#: Not available.
Synonym: Phosphoric Acid 85%; Phosphoric Acid; Orthophosphoric acid
Chemical Name: Not applicable.
Chemical Formula: Not applicable.

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: 1-800-901-7247
International Sales: 1-281-441-4400
Order Online: ScienceLab.com
CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

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<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phosphoric Acid</td>
<td>7664-38-2</td>
<td>85-88</td>
</tr>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>12-15</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: Phosphoric Acid: ORAL (LD50): Acute: 1530 mg/kg [Rat]. DERMAL (LD50): Acute: 2740 mg/kg [Rabbit]. DUST (LC50): Acute: &gt;850 mg/m 1 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion. Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive). Slightly hazardous in case of inhalation (lung sensitizer). Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, liver, skin, eyes, bone marrow. Repeated
or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

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### Section 4: First Aid Measures

**Eye Contact:**
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

**Serious Ingestion:**
Not available.

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### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:** Not available.

**Fire Hazards in Presence of Various Substances:** of metals

**Explosion Hazards in Presence of Various Substances:** Non-explosive in presence of open flames and sparks, of shocks.

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**
Reacts with metals to liberate flammable hydrogen gas. Formation of flammable gases with aldehydes, cyanides, mercaptins, and sulfides.

**Special Remarks on Explosion Hazards:** Mixtures with nitromethane are explosive. (Phosphoric Acid)

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### Section 6: Accidental Release Measures
Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Do not ingest. Do not breathe gas/fumes/ vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, combustible materials, metals, alkalis. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage: Keep container tightly closed. Keep container in a cool, well-ventilated area.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
Phosphoric Acid TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] TWA: 1 STEL: 3 (mg/m3) from OSHA (PEL) [United States] TWA: 1 STEL: 3 (mg/m3) from NIOSH TWA: 1 STEL: 3 (mg/m3) [Mexico] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Syrupy liquid Viscous liquid.)

Odor: Odorless.

Taste: Acid.

Molecular Weight: Not applicable.

Color: Clear Colorless.

pH (1% soln/water): Acidic.

Boiling Point: 158°C (316.4°F)

Melting Point: 21°C (69.8°F)

Critical Temperature: Not available.
Specific Gravity: 1.685 @ 25 C (Water = 1)
Vapor Pressure: 0.3 kPa (@ 20°C)
Vapor Density: 3.4 (Air = 1)
Volatility: Not available.
Odor Threshold: Not available.
Water/Oil Dist. Coeff.: Not available.
Ionicity (in Water): Not available.
Dispersion Properties: See solubility in water.
Solubility: Easily soluble in hot water. Soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.
Instability Temperature: Not available.
Conditions of Instability: Incompatible materials
Incompatibility with various substances: Reactive with oxidizing agents, combustible materials, metals, alkalis.
Special Remarks on Reactivity: Reacts with metals to liberate flammable hydrogen gas. Incompatible with sodium tetrahydroborate producing a violent exothermic reaction. Heat generated with: alcohols, glycols, aldehydes, amides, amines, azo-compounds, carbamates, caustics, esters, ketones, phenols and cresols, organophosphates, epoxides, combustible materials, unsaturated halides, organic peroxides. Formation of flammable gases, with aldehydes, cyanides, mercaptins, and sulfides. Formation of toxic fumes with cyanides, fluorides, halogenated organics, sulfides, and organic peroxides. Do not mix with solutions containing bleach or ammonia. Incompatible with nitromethane, chlorides + stainless steel. (Phosphoric Acid)
Special Remarks on Corrosivity: Minor corrosive effect on bronze. Severe corrosive effect on brass. Corrosive to ferrous metals and alloys.
Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.
Toxicity to Animals: Acute oral toxicity (LD50): 1530 mg/kg [Rat]. Acute dermal toxicity (LD50): 2740 mg/kg [Rabbit].
Chronic Effects on Humans: May cause damage to the following organs: blood, liver, skin, eyes, bone marrow.
Other Toxic Effects on Humans: Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (irritant), of ingestion, . Hazardous in case of skin contact (corrosive, permeator), of eye contact (corrosive).
Special Remarks on Toxicity to Animals: Not available.
Special Remarks on Chronic Effects on Humans: Not available.
Special Remarks on other Toxic Effects on Humans:
**Acute Potential Health Effects:** Skin: Corrosive and causes severe skin irritation and can cause severe skin burns. May affect behavior (somnolence or excitement) if absorbed through skin. Eyes: Corrosive. Liquid or vapor causes severe eye irritation and can cause severe eye burns leading to permanent corneal damage or chemical conjunctivitis. Ingestion: May be harmful if swallowed. Causes irritation and burns of the gastrointestinal (digestive) tract. Causes severe pain, nausea, vomiting, diarrhea, hematemesis, gastrointestinal hemorrhaging, and shock. May cause corrosion and permanent tissue destruction of the esophagus and digestive tract. May affect behavior and urinary system, liver (hepatocellular damage, hepatic enzymes increased), blood (blood dyscrasias). May also

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### Section 12: Ecological Information

**Ecotoxicity:** Not available.

**BOD5 and COD:** Not available.

**Products of Biodegradation:**
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

**Toxicity of the Products of Biodegradation:** The products of degradation are less toxic than the product itself.

**Special Remarks on the Products of Biodegradation:** Not available.

### Section 13: Disposal Considerations

**Waste Disposal:**
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

### Section 14: Transport Information

**DOT Classification:** Class 8: Corrosive material

**Identification:** Phosphoric acid (Phosphoric Acid) UNNA: 1805 PG: III

**Special Provisions for Transport:** Not available.

### Section 15: Other Regulatory Information

**Federal and State Regulations:**
Connecticut hazardous material survey.: Phosphoric Acid
Illinois toxic substances disclosure to employee act: Phosphoric acid
Illinois chemical safety act: Phosphoric acid
New York release reporting list: Phosphoric acid
Rhode Island RTK hazardous substances: Phosphoric acid
Pennsylvania RTK: Phosphoric acid
Minnesota: Phosphoric acid
Massachusetts RTK: Phosphoric acid
Massachusetts spill list: Phosphoric acid
New Jersey: Phosphoric acid
New Jersey spill list: Phosphoric acid
Louisiana spill reporting: Phosphoric acid
California Director's list of hazardous substances: Phosphoric acid
TSCA 8(b) inventory: Phosphoric Acid; Water
SARA 313 toxic chemical notification and release reporting: Phosphoric acid
CERCLA: Hazardous substances.: Phosphoric acid: 5000 lbs. (2268 kg)


**Other Classifications:**

**WHMIS (Canada):** CLASS E: Corrosive liquid.

**DSCL (EEC):**
R34- Causes burns. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

**HMIS (U.S.A.):**

Health Hazard: 3
Fire Hazard: 0  
Reactivity: 0  

Personal Protection: 

National Fire Protection Association (U.S.A.): 
Health: 3  
Flammability: 0  
Reactivity: 0  
Specific hazard: 

Protective Equipment: 
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

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**Section 16: Other Information**

**References:** Not available.  
**Other Special Considerations:** Not available.  
**Created:** 10/10/2005 08:47 PM  
**Last Updated:** 05/21/2013 12:00 PM

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Praxair Material Safety Data Sheet

1. Chemical Product and Company Identification

<table>
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<tr>
<th>Product Name:</th>
<th>Aluminum alkyls (trimethylaluminum) (MSDS No. P-6282-B)</th>
<th>Trade Names:</th>
<th>Praxair® TMA</th>
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<tbody>
<tr>
<td>Chemical Name:</td>
<td>Trimethylaluminum</td>
<td>Synonyms:</td>
<td>Aluminumtrimethyl, trimethyalane</td>
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<tr>
<td>Chemical Family:</td>
<td>Aluminum alkyls</td>
<td>Product Grades:</td>
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</table>

<table>
<thead>
<tr>
<th>Telephone:</th>
<th>Emergencies: 1-800-645-4633*</th>
<th>Company Name:</th>
<th>Praxair, Inc.</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>CHEMTREC: 1-800-424-9300*</td>
<td>39 Old Ridgebury Road</td>
<td>Danbury, CT 06810-5113</td>
</tr>
<tr>
<td>Routine:</td>
<td>1-800-PRAXAIR</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Call emergency numbers 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier, Praxair sales representative, or call 1-800-PRAXAIR (1-800-772-9247).

2. Hazards Identification

**EMERGENCY OVERVIEW**

DANGER! Pyrophoric, flammable liquid and vapor. Ignores on contact with air. Harmful if inhaled or swallowed. May cause eye, skin, and respiratory tract burns. Reacts violently with water or atmospheric moisture. Decomposes into irritating dust that may cause liver and kidney damage. Self-contained breathing apparatus and protective clothing must be worn by rescue workers. Under ambient conditions, this is a colorless liquid.

OSHA REGULATORY STATUS: This material is considered hazardous by the OSHA Hazard Communications Standard (29 CFR 1910.1200).

POTENTIAL HEALTH EFFECTS:

Effects of a Single (Acute) Overexposure

**Inhalation.** Reaction with moist tissues causes burns. Residual dusts may cause irritation of the mouth, nose, and throat.

**Skin Contact.** May cause irritation or burns.

**Swallowing.** Reaction of liquid with moisture may cause severe burns of the mouth, esophagus, and stomach lining. Residual dusts have been implicated in kidney and liver damage in laboratory animals.

**Eye Contact.** Contact with the liquid may cause severe eye burns. Dusts and vapor may irritate the eyes.
Effects of Repeated (Chronic) Overexposure. Repeated or prolonged exposure of the skin may cause cracking and drying.

Other Effects of Overexposure. None known.

Medical Conditions Aggravated by Overexposure. Irritating effects of dusts and mists may aggravate an existing respiratory condition. Prolonged exposure of the skin may aggravate an existing dermatitis.

CARCINOGENICITY: Trimethylaluminum is not listed by NTP, OSHA, or IARC.

POTENTIAL ENVIRONMENTAL EFFECTS: None known. For further information, see section 12, Ecological Information.

3. Composition/Information on Ingredients

See section 16 for important information about mixtures.

<table>
<thead>
<tr>
<th>COMPONENT</th>
<th>CAS NUMBER</th>
<th>CONCENTRATION</th>
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</thead>
<tbody>
<tr>
<td>Trimethylaluminum</td>
<td>75-24-1</td>
<td>&gt;99%*</td>
</tr>
</tbody>
</table>

*The symbol > means "greater than."

4. First Aid Measures

INHALATION: Immediately remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, qualified personnel may give oxygen. Call a physician.

SKIN CONTACT: Immediately flush exposed areas with large quantities of water. In case of massive exposure, remove contaminated clothing while showering with water. Do not remove any clothing that is stuck to the skin. Call a physician.

SWALLOWING: If victim is conscious, wash out mouth with water. Call a physician.

EYE CONTACT: Immediately flush eyes thoroughly with plenty of water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. See a physician, preferably an ophthalmologist, immediately.

NOTES TO PHYSICIAN: There is no specific antidote. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

5. Fire Fighting Measures

FLAMMABLE PROPERTIES: Liquid and vapor ignite spontaneously in air.

SUITABLE EXTINGUISHING MEDIA: Use dry powder, soda ash, or lime. Never use water, foam, or halogenated compounds.

PRODUCTS OF COMBUSTION: Aluminum dusts, oxides, and alkyls; CO; CO₂

PROTECTION OF FIREFIGHTERS: DANGER! Pyrophoric, flammable liquid and vapor. Ignores spontaneously in air. Burning material may release toxic and corrosive fumes. Immediately evacuate all personnel from danger area. Use self-contained breathing apparatus and protective clothing. Use appropriate media to control fire. Shut off flow if you can do so without risk. Move containers away from fire area if without risk. On-site fire brigades must comply with OSHA 29 CFR 1910.156.
Specific Physical and Chemical Hazards. No part of container should be subjected to a temperature higher than 125°F (52°C). Back flow into container may cause reaction. In a controlled fire, unreacted trimethylaluminum may reignite on contact with air or water.

Protective Equipment and Precautions for Firefighters. Firefighters should wear self-contained breathing apparatus and full fire-fighting turnout gear.

6. Accidental Release Measures

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

DANGER! Pyrophoric, flammable liquid and vapor.

Personal Precautions. Ignites spontaneously on contact with air. Forms explosive mixtures with air. Immediately evacuate all personnel from danger area. Self-contained breathing apparatus and protective clothing must be worn by rescue workers. Reacts violently with water. Avoid contact with water or moisture. Back flow into container may cause reaction. Shut off flow if without risk. Ventilate area or move container to a well-ventilated area. Prevent waste from contaminating surrounding environment.

Environmental Precautions. Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.

7. Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING: Flammable liquid and vapor ignite spontaneously in air. Do not breathe vapor. Use only with adequate ventilation or respiratory protection. Do not get liquid or vapor in eyes, on skin, or on clothing. Keep away from air, water or moisture, oxidizing agents, and other flammables. Use only spark-proof tools and explosion-proof equipment. Keep away from heat, sparks, and open flame. Do not eat, drink, or smoke in areas where this material is stored or used. After working with this material, wash face and hands thoroughly with soap and water before eating drinking, smoking, applying cosmetics, or using the toilet. Have safety showers and eyewash fountains immediately available. Protect containers from damage. For other precautions in using trimethylaluminum, see section 16.

PRECAUTIONS TO BE TAKEN IN STORAGE: Store in a cool, dry place away from direct sunlight. Keep storage containers tightly closed. This material must be handled and stored under a blanket of nitrogen and used only in a closed system. Store away from oxygen, chlorine, and other oxidizers. Firmly secure containers upright to keep them from falling or being knocked over. Keep valves tightly closed. Post “No Smoking or Open Flames” signs in storage and use areas. There must be no sources of ignition. Store only where temperature will not exceed 125°F (52°C). Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods.

RECOMMENDED PUBLICATIONS: For further information on storage, handling, and use, see NFPA 30, Flammable and Combustible Liquids Code, published by the National Fire Protection Association, 1 Batterymarch Park, PO Box 9101, Quincy, MA 02269-9101; 1-800-344-3555; www.nfpa.org. For further information on storage, handling, and use, see Praxair publication P-14-153, Guidelines for Handling Gas Cylinders and Containers. Obtain from your local supplier.
8. Exposure Controls/Personal Protection

COMPONENT | OSHA PEL | ACGIH TLV-TWA (2008)
--- | --- | ---
Trimethylaluminum | Not Established. | Not Established.
*(c) – ceiling. Ceiling values are not Time-Weighted-Average (TWA).
**N.E.–Not Established.

IDLH = Not available.

ENGINEERING CONTROLS:

Local Exhaust. Inadequate; see SPECIAL

Mechanical (General). Inadequate; see SPECIAL

Special. Use only in a closed system. This material is air- and moisture-sensitive. It should be maintained under a dry, inert atmosphere and used in an enclosed device such as a glove box.

Other. See SPECIAL.

PERSONAL PROTECTIVE EQUIPMENT:

Skin Protection. Wear work gloves when handling containers; fire resistant gloves where contact with product may occur.

Eye/Face Protection. Wear safety glasses when handling containers; safety goggles or a full face shield where contact with product may occur. Select eye protection in accordance with OSHA 29 CFR 1910.133. Do not wear contact lenses. Protective clothing such as fire resistant garments where needed. Select in accordance with OSHA 29 CFR 1910.123 and 1910.133.

Respiratory Protection. A respiratory protection program that meet OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable) requirements must be followed whenever workplace conditions warrant respirator use. Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure (e.g., an organic vapor cartridge). For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus.

9. Physical and Chemical Properties

<table>
<thead>
<tr>
<th>PROPERTY</th>
<th>VALUE</th>
</tr>
</thead>
<tbody>
<tr>
<td>APPEARANCE:</td>
<td>Colorless liquid</td>
</tr>
<tr>
<td>ODOR:</td>
<td>Unknown</td>
</tr>
<tr>
<td>ODOR THRESHOLD:</td>
<td>Not available.</td>
</tr>
<tr>
<td>PHYSICAL STATE:</td>
<td>Liquid at normal temperature and pressure</td>
</tr>
<tr>
<td>pH:</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>MELTING POINT at 1 atm:</td>
<td>59°F (15°C)</td>
</tr>
<tr>
<td>BOILING POINT at 1 atm:</td>
<td>257°F (125°C)</td>
</tr>
<tr>
<td>FLASH POINT (test method):</td>
<td>Not available.</td>
</tr>
<tr>
<td>EVAPORATION RATE (Butyl Acetate = 1):</td>
<td>Not available.</td>
</tr>
<tr>
<td>FLAMMABILITY:</td>
<td>Flammable</td>
</tr>
<tr>
<td>FLAMMABLE LIMITS IN AIR, % by volume:</td>
<td>LOWER: Not available.  UPPER: Not available.</td>
</tr>
<tr>
<td>VAPOR PRESSURE at 140°F (60°C):</td>
<td>1.34 psia (9.24 kPa abs, 69.3 mm Hg)</td>
</tr>
</tbody>
</table>
10. Stability and Reactivity

CHEMICAL STABILITY: ☑ Unstable ☑ Stable

NOTE: Trimethylaluminum is stable as shipped and when stored, handled, and used under the conditions specified in this MSDS, sections 7, 10, and 16. Trimethylaluminum must not be exposed to air, water, or moisture.

CONDITIONS TO AVOID: High temperatures, sparks, and flames.

INCOMPATIBLE MATERIALS: Air, water, moisture, oxidizers.

HAZARDOUS DECOMPOSITION PRODUCTS: Aluminum oxide dust, CO, CO₂.

POSSIBILITY OF HAZARDOUS REACTIONS: ☑ May Occur ☑ Will Not Occur

Decomposition may produce aluminum oxide dust, CO, and CO₂.

11. Toxicological Information

ACUTE DOSE EFFECTS: None known.

STUDY RESULTS: None known.

12. Ecological Information

ECOTOXICITY: No known effects.

OTHER ADVERSE EFFECTS: Trimethylaluminum does not contain any Class I or Class II ozone-depleting chemicals.
13. Disposal Considerations

WASTE DISPOSAL METHOD: Do not attempt to dispose of residual or unused quantities. Return cylinder to supplier.

14. Transport Information

<table>
<thead>
<tr>
<th>DOT/IMO SHIPPING NAME:</th>
<th>Aluminum alkyls</th>
</tr>
</thead>
<tbody>
<tr>
<td>HAZARD CLASS: 4.2</td>
<td>PACKING GROUP/Zone: I</td>
</tr>
<tr>
<td>Identification NUMBER: UN3051</td>
<td>PRODUCT RQ: None</td>
</tr>
<tr>
<td>SHIPPING LABEL(s):</td>
<td>SPONTANEOUSLY COMBUSTIBLE, DANGEROUS WHEN WET</td>
</tr>
<tr>
<td>PLACARD (when required):</td>
<td>SPONTANEOUSLY COMBUSTIBLE, DANGEROUS WHEN WET</td>
</tr>
</tbody>
</table>

MARINE POLLUTANTS: Trimethylaluminum is not listed as a marine pollutant by DOT.

15. Regulatory Information

The following selected regulatory requirements may apply to this product. Not all such requirements are identified. Users of this product are solely responsible for compliance with all applicable federal, state, and local regulations.

U.S. FEDERAL REGULATIONS:

EPA (ENVIRONMENTAL PROTECTION AGENCY)


Reportable Quantity (RQ): None

SARA: SUPERFUND AMENDMENT AND REAUTHORIZATION ACT:

SECTIONS 302/304: Require emergency planning based on Threshold Planning Quantity (TPQ) and release reporting based on Reportable Quantities (RQ) of Extremely Hazardous Substances (EHS) (40 CFR Part 355):

TPQ: None

EHS RQ (40 CFR 355): None

SECTIONS 311/312: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are as follows:

IMMEDIATE: Yes

DELAYED: Yes

PRESSURE: No

REACTIVITY: Yes

FIRE: Yes

SECTION 313: Requires submission of annual reports of release of toxic chemicals that appear in 40 CFR Part 372.

Trimethylaluminum is not subject to reporting under Section 313.

40 CFR 68: RISK MANAGEMENT PROGRAM FOR CHEMICAL ACCIDENTAL RELEASE PREVENTION: Requires development and implementation of risk management programs at facilities that manufacture, use, store, or otherwise handle regulated substances in quantities that exceed specified thresholds.

Trimethylaluminum is not listed as a regulated substance.

TSCA: TOXIC SUBSTANCES CONTROL ACT: Trimethylaluminum is listed on the TSCA inventory.
OSHA: OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:
29 CFR 1910.119: PROCESS SAFETY MANAGEMENT OF HIGHLY HAZARDOUS CHEMICALS: Requires facilities to develop a process safety management program based on Threshold Quantities (TQ) of highly hazardous chemicals.
Trimethylaluminum is not listed in Appendix A as a highly hazardous chemical. However, any process that involves a flammable liquid or gas on site in one location in quantities of 10,000 lb (4536 kg) or greater is covered under this regulation unless the substance is used as a fuel.

STATE REGULATIONS:
CALIFORNIA: Trimethylaluminum is not listed by California under the SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT OF 1986 (Proposition 65).
 PENNSYLVANIA: Trimethylaluminum is subject to the PENNSYLVANIA WORKER AND COMMUNITY RIGHT-TO-KNOW ACT (35 P.S. Sections 7301-7320).

### 16. Other information

Be sure to read and understand all labels and instructions supplied with all containers of this product.

**OTHER HAZARDOUS CONDITIONS OF HANDLING, STORAGE, AND USE:** Pyrophoric, flammable liquid and vapor. Reacts with water and atmospheric moisture. Use only in a closed system thoroughly purged with an inert gas prior to introduction of trimethylaluminum. **Use only with compatible materials and equipment.** Use piping and equipment adequately designed to withstand pressures to be encountered. Prevent reverse flow. Reverse flow into container may cause reaction. Use a check valve or other protective device in any line or piping from the container.

**MIXTURES:** When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Remember, chemicals have properties that can cause serious injury or death.

**HAZARD RATING SYSTEMS:**

<table>
<thead>
<tr>
<th>NFPA RATINGS:</th>
<th>HMIS RATINGS:</th>
</tr>
</thead>
<tbody>
<tr>
<td>HEALTH</td>
<td>HEALTH</td>
</tr>
<tr>
<td>FLAMMABILITY</td>
<td>FLAMMABILITY</td>
</tr>
<tr>
<td>INSTABILITY</td>
<td>PHYSICAL HAZARD</td>
</tr>
<tr>
<td>SPECIAL</td>
<td>3</td>
</tr>
</tbody>
</table>

*NOTE: The hazards of this material have not been fully investigated.*
Praxair asks users of this product to study this MSDS and become aware of product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this MSDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information.

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Material Safety Data Sheet. Since the use of this information and the conditions of use of the product are not within the control of Praxair, Inc., it is the user’s obligation to determine the conditions of safe use of the product.

Praxair MSDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current MSDSs for these products, contact your Praxair sales representative or local distributor or supplier, or download from www.praxair.com. If you have questions regarding Praxair MSDSs, would like the form number and date of the latest MSDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR; Address: Praxair Call Center, Praxair, Inc., PO Box 44, Tonawanda, NY 14151-0044).

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Material Safety Data Sheet
Sulfuric acid MSDS

Section 1: Chemical Product and Company Identification

Product Name: Sulfuric acid
Catalog Codes: SLS2539, SLS1741, SLS3166, SLS2371, SLS3793
CAS#: 7664-93-9
RTECS: WS5600000
TSCA: TSCA 8(b) inventory: Sulfuric acid
CI#: Not applicable.
Synonym: Oil of Vitriol; Sulfuric Acid
Chemical Name: Hydrogen sulfate
Chemical Formula: H2-SO4

Contact Information:
Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396
US Sales: 1-800-901-7247
International Sales: 1-281-441-4400
Order Online: ScienceLab.com
CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
International CHEMTREC, call: 1-703-527-3887
For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

<table>
<thead>
<tr>
<th>Name</th>
<th>CAS #</th>
<th>% by Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sulfuric acid</td>
<td>7664-93-9</td>
<td>95 - 98</td>
</tr>
</tbody>
</table>

Toxicological Data on Ingredients: Sulfuric acid: ORAL (LD50): Acute: 2140 mg/kg [Rat.]. VAPOR (LC50): Acute: 510 mg/m 2 hours [Rat]. 320 mg/m 2 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (irritant, corrosive), of ingestion, of inhalation. Liquid or spray mist may produce tissue damage particularly on mucous membranes of eyes, mouth and respiratory tract. Skin contact may produce burns. Inhalation of the spray mist may produce severe irritation of respiratory tract, characterized by coughing, choking, or shortness of breath. Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated or prolonged...
contact with spray mist may produce chronic eye irritation and severe skin irritation. Repeated or prolonged exposure to spray mist may produce respiratory tract irritation leading to frequent attacks of bronchial infection. Repeated exposure to a highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

### Section 4: First Aid Measures

**Eye Contact:**
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. Get medical attention immediately.

**Skin Contact:**
In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Cover the irritated skin with an emollient. Cold water may be used. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention immediately.

**Serious Skin Contact:**
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

**Inhalation:**
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

**Serious Inhalation:**
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. **WARNING:** It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek immediate medical attention.

**Ingestion:**
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

**Serious Ingestion:** Not available.

### Section 5: Fire and Explosion Data

**Flammability of the Product:** Non-flammable.

**Auto-Ignition Temperature:** Not applicable.

**Flash Points:** Not applicable.

**Flammable Limits:** Not applicable.

**Products of Combustion:**
Products of combustion are not available since material is non-flammable. However, products of decomposition include fumes of oxides of sulfur. Will react with water or steam to produce toxic and corrosive fumes. Reacts with carbonates to generate carbon dioxide gas. Reacts with cyanides and sulfides to form poisonous hydrogen cyanide and hydrogen sulfide respectively.

**Fire Hazards in Presence of Various Substances:** Combustible materials

**Explosion Hazards in Presence of Various Substances:**

**Fire Fighting Media and Instructions:** Not applicable.

**Special Remarks on Fire Hazards:**
Metal acetylides (Monocesium and Monorubidium), and carbides ignite with concentrated sulfuric acid. White Phosphorous + boiling Sulfuric acid or its vapor ignites on contact. May ignite other combustible materials. May cause fire when sulfuric acid is mixed with Cyclopentadiene, cyclopentanone oxime, nitroaryl amines, hexalithium disilicide, phosphorous (III) oxide, and oxidizing agents such as chlorates, halogens, permanganates.
Special Remarks on Explosion Hazards:
Mixtures of sulfuric acid and any of the following can explode: p-nitrotoluene, pentasilver trihydroxydiaminophosphate, perchlorates, peroxides, alcohols with strong hydrogen peroxide, ammonium tetraperoxycromate, mercuric nitrate, potassium chloride, potassium permanganate with potassium chloride, carbides, nitro compounds, nitrates, carbides, phosphorous, iodides, picrates, fulminates, dienes, alcohols (when heated) Nitramide decomposes explosively on contact with concentrated sulfuric acid. 1,3,5-Trinitrosohexahydro-1,3,5-triazine + sulfuric acid causes explosive decomposition.

Section 6: Accidental Release Measures

Small Spill:
Dilute with water and mop up, or absorb with an inert dry material and place in an appropriate waste disposal container. If necessary: Neutralize the residue with a dilute solution of sodium carbonate.

Large Spill:
Corrosive liquid. Poisonous liquid. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Use water spray curtain to divert vapor drift. Use water spray to reduce vapors. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Neutralize the residue with a dilute solution of sodium carbonate. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep container dry. Do not ingest. Do not breathe gas/fumes/vapor/spray. Never add water to this product. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture. May corrode metallic surfaces. Store in a metallic or coated fiberboard drum using a strong polyethylene inner package.

Storage:
Hygroscopic. Reacts violently with water. Keep container tightly closed. Keep container in a cool, well-ventilated area. Do not store above 23°C (73.4°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 1 STEL: 3 (mg/m3) [Australia] Inhalation TWA: 1 (mg/m3) from OSHA (PEL) [United States] Inhalation TWA: 1 STEL: 3 (mg/m3) from ACGIH (TLV) [United States] [1999] Inhalation TWA: 1 (mg/m3) from NIOSH [United States] Inhalation TWA: 1 (mg/m3) [United Kingdom (UK)] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties
Physical state and appearance: Liquid. (Thick oily liquid.)

Odor: Odorless, but has a choking odor when hot.

Taste: Marked acid taste. (Strong.)

Molecular Weight: 98.08 g/mole

Color: Colorless.

pH (1% soln/water): Acidic.

Boiling Point:
270°C (518°F) - 340 deg. C Decomposes at 340 deg. C

Melting Point: -35°C (-31°F) to 10.36 deg. C (93% to 100% purity)

Critical Temperature: Not available.

Specific Gravity: 1.84 (Water = 1)

Vapor Pressure: Not available.

Vapor Density: 3.4 (Air = 1)

Volutility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water.

Solubility:
Easily soluble in cold water. Sulfuric is soluble in water with liberation of much heat. Soluble in ethyl alcohol.

---

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability:
Conditions to Avoid: Incompatible materials, excess heat, combustible material materials, organic materials, exposure to moist air or water, oxidizers, amines, bases. Always add the acid to water, never the reverse.

Incompatibility with various substances:
Reactive with oxidizing agents, reducing agents, combustible materials, organic materials, metals, acids, alkalis, moisture.

Corrosivity:
Extremely corrosive in presence of aluminum, of copper, of stainless steel(316). Highly corrosive in presence of stainless steel(304). Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Hygroscopic. Strong oxidizer. Reacts violently with water and alcohol especially when water is added to the product. Incompatible (can react explosively or dangerously) with the following: ACETIC ACID, ACRYLIC ACID, AMMONIUM HYDROXIDE, CRESOL, CUMENE, DICHLOROETHYL ETHER, ETHYLENE CYANOHYDRIN, ETHYLENEIMINE, NITRIC ACID, 2-NITROPROPANE, PROPYLENE OXIDE, SULFOLANE, VINYLIDENE CHLORIDE, DIETHYLENE GLYCOL MONOMETHYL ETHER, ETHYL ACETATE, ETHYLENE CYANOHYDRIN, ETHYLENE GLYCOL MONOETHYL ETHER ACETATE, GLYOXAL, METHYL ETHYL KETONE, dehydrating agents, organic materials, moisture (water), Acetic anhydride, Acetone, cyanohydrin, Acetone+nitric acid, Acetone + potassium dichromate, Acetonitrile, Acrolein, Acrylonitrile, Acrylonitrile +water, Alcohols + hydrogen peroxide, ally compounds such as Allyl alcohol, and Allyl Chloride, 2-Aminoethanol, Ammonium hydroxide, Ammonium triperchormate, Aniline, Bromate + metals, Bromine pentafluoride, n-Butyraldehyde, Carbides, Cesium acetylene carbide, Chlorates, Cyclopentanone oxime, chlorinates, Chlorates + metals, Chlorine trifluoride, Chlorosulfonic acid, 2-cyano-4-nitrobenzenediazonium hydrogen sulfate, Cuprous nitride, p-chloronitrobenzene, 1,5-Dinitronaphthlene +
sulfur, Diisobutylene, p-dimethylaminobenzaldehyde, Dimethylbenzylcarbinol + hydrogen peroxide, Epichlorohydrin, Ethyl alcohol + hydrogen peroxide, Ethylene diamine, Ethylene glycol and other glycols, Ethylenimine, Fulminates, hydrogen peroxide, Hydrochloric acid, Hydrofluoric acid, Iodine heptafluoride, Indane + nitric acid, Iron, Isoprene, Lithium silicide, Mercuric nitride, Mesityl oxide, Mercury nitride, Metals (powdered), Nitromethane, Nitric acid + glycerides, n-Nitrotoluene, Pentasilver trihydroxydiaminophosphate, Perchlorates, Perchloric acid, Permanganates + benzene, 1-Phenyl-2-methylpropyl alcohol + hydrogen peroxide, Phosphorus, Phosphorus isocyanate, Picrates, Potassium tert-butoxide, Potassium chlorate, Potassium Permanganate and other permanganates, halogens, amines, Potassium Permanganate + Potassium chloride, Potassium Permanganate + water, Propiolactone (beta)-, Pyridine, Rubidium aceteylene carbide, Silver permanganate, Sodium, Sodium carbonate, sodium hydroxide, Steel, styrene monomer, toluene + nitric acid, Vinyl acetate, Thalium (I) azidodithiocarbonate, Zinc chloride, Zinc iodide, azides, carbonates, cyanides, sulfides, sulfites, alkali hydrides, carboxylic acid anhydrides, nitriles, olefinic organics, aqueous acids, cyclopentadiene, cyano-alcohols, metal acetylides, Hydrogen gas is generated by the action of the acid on most metals (i.e. lead, copper, tin, zinc, aluminum, etc.). Concentrated sulfuric acid oxidizes, dehydrates, or sulfonates most organic compounds.

Special Remarks on Corrosivity:
Non-corrosive to lead and mild steel, but dilute acid attacks most metals. Attacks many metals releasing hydrogen. Minor corrosive effect on bronze. No corrosion data on brass or zinc.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2140 mg/kg [Rat.]. Acute toxicity of the vapor (LC50): 320 mg/m3 2 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 1 (Proven for human.) by IARC, + (Proven.) by OSHA. Classified A2 (Suspected for human.) by ACGIH. May cause damage to the following organs: kidneys, lungs, heart, cardiovascular system, upper respiratory tract, eyes, teeth.

Other Toxic Effects on Humans:
Extremely hazardous in case of inhalation (lung corrosive). Very hazardous in case of skin contact (corrosive, irritant, permeator), of eye contact (corrosive), of ingestion, .

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
Mutagenicity: Cytogenetic Analysis: Hamster, ovary = 4mmol/L Reproductive effects: May cause adverse reproductive effects based on animal data. Developmental abnormalities (musculoskeletal) in rabbits at a dose of 20 mg/m3 for 7 hrs. (RTECS) Teratogenecity: neither embryotoxic, fetoxic, nor teratogenetic in mice or rabbits at inhaled doses producing some maternal toxicity

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes severe skin irritation and burns. Continued contact can cause tissue necrosis. Eye: Causes severe eye irritation and burns. May cause irreversible eye injury. Ingestion: Harmful if swallowed. May cause permanent damage to the digestive tract. Causes gastrointestinal tract burns. May cause perforation of the stomach, GI bleeding, edema of the glottis, necrosis and scarring, and sudden circulatory collapse(similar to acute inhalation). It may also cause systemic toxicity with acidosis. Inhalation: May cause severe irritation of the respiratory tract and mucous membranes with sore throat, coughing, shortness of breath, and delayed lung edema. Causes chemical burns to the respiratory tract. Inhalation may be fatal as a result of spasm, inflammation, edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Cause corrosive action on mucous membranes. May affect cardiovascular system (hypotension, depressed cardiac output, bradycardia). Circulatory collapse with clammy skin, weak and rapid pulse, shallow respiration, and scanty urine may follow. Circulatory shock is often the immediate cause of death. May also affect teeth(changes in teeth and supporting structures - erosion, discoloration). Chronic Potential Health Effects: Inhalation: Prolonged or repeated inhalation may affect behavior (muscle contraction or spasticity), urinary system (kidney damage), and cardiovascular system, heart (ischemic heart leisions), and respiratory system/lungs(pulmonary edema, lung damage), teeth (dental discoloration, erosion). Skin: Prolonged or repeated skin contact may cause dermatitis, an allergic skin reaction.
Section 12: Ecological Information

Ecotoxicity: Ecotoxicity in water (LC50): 49 mg/l 48 hours [bluegill/sunfish].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Sulfuric acid may be placed in sealed container or absorbed in vermiculite, dry sand, earth, or a similar material. It may also be diluted and neutralized. Be sure to consult with local or regional authorities (waste regulators) prior to any disposal. Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: Class 8: Corrosive material

Identification: : Sulfuric acid UNNA: 1830 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Other Regulations:

Other Classifications:
WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS E: Corrosive liquid.

DSCL (EEC):
R35- Causes severe burns. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S30- Never add water to this product. S45- In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

HMIS (U.S.A.):
  Health Hazard: 3
  Fire Hazard: 0
  Reactivity: 2
Personal Protection:

National Fire Protection Association (U.S.A.):

- **Health:** 3
- **Flammability:** 0
- **Reactivity:** 2
- **Specific hazard:**

Protective Equipment:
Gloves. Full suit. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Face shield.

### Section 16: Other Information

**References:**
- The Sigma-Aldrich Library of Chemical Safety Data, Edition II.

**Other Special Considerations:** Not available.

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