Section 1 - Product and Company Information

Product Name: TETRAHYDROFURAN, ANHYDROUS, >=99.9%, INHIBITOR-FREE  
Product Number: 401757  
Brand: ALDRICH  
Company: Sigma-Aldrich  
Address: 3050 Spruce Street  
SAINT LOUIS MO 63103 US  
Technical Phone: 800-325-5832  
Fax: 800-325-5052  
Emergency Phone: 314-776-6555

Section 2 - Composition/Information on Ingredient

Substance Name: TETRAHYDROFURAN (Inhibitor free)  
CAS #: 109-99-9  
SARA 313: No  
Formula: C4H8O  
Synonyms: Agrisynth THF * Butane, 1,4-epoxy- * Butane, alpha,delta-oxide * Cyclotetramethylene oxide * Diethylene oxide * 1,4-Epoxybutane * Furanidine * NCI-C60560 * Oxacyclopentane * Oxolane * RCRA waste number U213 * Tetrahydrofuraan (Dutch) * Tetrahydrofuran (ACGIH:OSHA) * Tetrahydrofuranne (French) * Tetraidrofurano (Italian) * Tetramethylene oxide  
RTECS Number: LU5950000

Section 3 - Hazards Identification

EMERGENCY OVERVIEW  

HMIS RATING  
HEALTH: 2*  
FLAMMABILITY: 3  
REACTIVITY: 3

NFPA RATING  
HEALTH: 2  
FLAMMABILITY: 3  
REACTIVITY: 3

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures
ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.

INHALATION EXPOSURE
If inhaled, remove to fresh air. If not breathing give artificial respiration. If breathing is difficult, give oxygen.

DERMAL EXPOSURE
In case of contact, immediately wash skin with soap and copious amounts of water.

EYE EXPOSURE
In case of contact, immediately flush eyes with copious amounts of water for at least 15 minutes.

Section 5 - Fire Fighting Measures

FLAMMABLE HAZARDS
Flammable Hazards: Yes
Peroxide Former: Yes

EXPLOSION HAZARDS
Vapor may travel considerable distance to source of ignition and flash back. Container explosion may occur under fire conditions.

FLASH POINT
1.4 °F - 17.0 °C Method: closed cup

EXPLOSION LIMITS
Lower: 1.8 % Upper: 11.8 %

AUTOIGNITION TEMP
321 °C

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: For small (incipient) fires, use media such as "alcohol" foam, dry chemical, or carbon dioxide. For large fires, apply water from as far as possible. Use very large quantities (flooding) of water applied as a mist or spray; solid streams of water may be ineffective. Cool all affected containers with flooding quantities of water.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes.
Specific Hazard(s): Vapor may travel considerable distance to source of ignition and flash back. Flammable liquid. Emits toxic fumes under fire conditions.
Specific Method(s) of Fire Fighting: Use water spray to cool fire-exposed containers.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area. Shut off all sources of ignition.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear respirator, chemical safety goggles, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Cover with dry-lime, sand, or soda ash. Place in covered containers using non-sparking tools and transport outdoors. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Avoid breathing vapor. Avoid contact with eyes, skin, and clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep container closed. Keep away from heat, sparks, and open flame.

SPECIAL REQUIREMENTS
Test for peroxide formation periodically and before distillation. Do not distill to dryness. Store under inert gas.

Section 8 - Exposure Controls / PPE

ENGINEERING CONTROLS
Safety shower and eye bath. Use nonsparking tools. Mechanical exhaust required.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Hand: Compatible chemical-resistant gloves. Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Wash contaminated clothing before reuse.

EXPOSURE LIMITS, RTECS

<table>
<thead>
<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>USA</td>
<td>ACGIH</td>
<td>STEL</td>
<td>250 PPM</td>
</tr>
<tr>
<td>USA</td>
<td>ACGIH</td>
<td>TWA</td>
<td>200 PPM</td>
</tr>
<tr>
<td>USA</td>
<td>MSHA Standard-air TWA</td>
<td>200 PPM (590 MG/M3)</td>
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</tr>
<tr>
<td>USA</td>
<td>OSHA.</td>
<td>PEL</td>
<td>8H TWA 200 PPM (590 MG/M3)</td>
</tr>
<tr>
<td>New Zealand</td>
<td>OEL</td>
<td>Remarks: check ACGIH TLV</td>
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<tr>
<td>USA</td>
<td>NIOSH</td>
<td>TWA</td>
<td>200 PPM</td>
</tr>
<tr>
<td></td>
<td></td>
<td>STEL</td>
<td>250 PPM</td>
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EXPOSURE LIMITS

<table>
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<tr>
<th>Country</th>
<th>Source</th>
<th>Type</th>
<th>Value</th>
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<tr>
<td>Poland</td>
<td>NDS</td>
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<tr>
<td>Poland</td>
<td>NDSCh</td>
<td></td>
<td>300 MG/M3</td>
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<tr>
<td>Poland</td>
<td>NDSP</td>
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</table>

Section 9 - Physical/Chemical Properties
Appearance

Physical State: Liquid
Color: Colorless

Property

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
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<tbody>
<tr>
<td>Molecular Weight</td>
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<tr>
<td>pH</td>
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<td>BP/BP Range</td>
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<td>760 mmHg</td>
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<tr>
<td>MP/MP Range</td>
<td>- 108.0 °C</td>
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<td>Freezing Point</td>
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<td>Vapor Pressure</td>
<td>143 mmHg</td>
<td>20 °C</td>
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<td>Vapor Density</td>
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<td>Saturated Vapor Conc.</td>
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<td>SG/Density</td>
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<tr>
<td>Bulk Density</td>
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<tr>
<td>Odor Threshold</td>
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<tr>
<td>Volatile%</td>
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<td>VOC Content</td>
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<td>Water Content</td>
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</tr>
<tr>
<td>Solvent Content</td>
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<td>Evaporation Rate</td>
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<tr>
<td>Viscosity</td>
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<tr>
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<td>Partition Coefficient</td>
<td>Log Kow: 0.46</td>
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<td>Decomposition Temp.</td>
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<tr>
<td>Flash Point</td>
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<td>Method: closed cup</td>
</tr>
<tr>
<td>Explosion Limits</td>
<td>Lower: 1.8 %</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Upper: 11.8 %</td>
<td></td>
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<tr>
<td>Flammability</td>
<td>N/A</td>
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<tr>
<td>Autoignition Temp</td>
<td>321 °C</td>
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<tr>
<td>Refractive Index</td>
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<td>Optical Rotation</td>
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<td>Miscellaneous Data</td>
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</tr>
<tr>
<td>Solubility</td>
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<td></td>
</tr>
</tbody>
</table>

N/A = not available

Section 10 - Stability and Reactivity

STABILITY

Stable: Stable.
Materials to Avoid: Oxidizing agents, Oxygen.

HAZARDOUS DECOMPOSITION PRODUCTS

Hazardous Decomposition Products: Carbon monoxide, Carbon dioxide.

HAZARDOUS POLYMERIZATION

Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE

Skin Contact: May cause skin irritation.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes eye irritation.
Inhalation: Material is irritating to mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)

SIGNS AND SYMPTOMS OF EXPOSURE

To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Exposure to high airborne concentrations can cause anesthetic effects. Can cause CNS depression. Exposure can cause: Coughing, chest pains, difficulty in breathing.

TOXICITY DATA

Oral
Rat
1650 mg/kg
LD50

Inhalation
Rat
21,000 ppm
LC50

Intraperitoneal
Rat
2900 MG/KG
LD50

Intraperitoneal
Mouse
1900 MG/KG
LD50

Oral
Guinea pig
2300 mg/kg
LD50

CHRONIC EXPOSURE - CARCINOGEN

Result: This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Species: Rat
Route of Application: Inhalation
Dose: 1800 PPM
Exposure Time: 6H/2Y
Frequency: I

Species: Mouse
Route of Application: Inhalation
Dose: 1800 PPM
Exposure Time: 6H/2Y
Frequency: I
Result: Tumorigenic: Carcinogenic by RTECS criteria. Liver: Tumors.

NTP CARCINOGEN LIST

Rating: Clear evidence.
Species: Mouse
Route: Inhalation
CHRONIC EXPOSURE - TERATOGEN

Species: Rat  
Dose: 5000 PPM/6H  
Route of Application: Inhalation  
Exposure Time: (6-19D PREG)  
Result: Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

CHRONIC EXPOSURE - REPRODUCTIVE HAZARD

Species: Mouse  
Dose: 1800 PPM/6H  
Route of Application: Inhalation  
Exposure Time: (6-17D PREG)  
Result: Effects on Fertility: Post-implantation mortality (e.g., dead and/or resorbed implants per total number of implants).

Section 12 - Ecological Information

ACUTE ECOTOXICITY TESTS

Test Type: LC50 Fish  
Species: Pimephales promelas (Fathead minnow)  
Time: 96 h  
Value: 2,160 mg/l

Test Type: EC50 Daphnia  
Species: Daphnia magna  
Time: 24 h  
Value: 5,930 mg/l

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION

Contact a licensed professional waste disposal service to dispose of this material. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT

Proper Shipping Name: Tetrahydrofuran  
UN#: 2056  
Class: 3  
Packing Group: Packing Group II  
Hazard Label: Flammable liquid  
PIH: Not PIH

IATA

Proper Shipping Name: Tetrahydrofuran  
IATA UN Number: 2056  
Hazard Class: 3  
Packing Group: II

Section 15 - Regulatory Information

EU DIRECTIVES CLASSIFICATION
Symbol of Danger: F-Xi
Indication of Danger: Highly Flammable. Irritant.
R: 11-19-36/37
Risk Statements: Highly flammable. May form explosive peroxides. Irritating to eyes and respiratory system.
S: 16-29-33
Safety Statements: Keep away from sources of ignition - no smoking. Do not empty into drains. Take precautionary measures against static discharges.

US CLASSIFICATION AND LABEL TEXT
Risk Statements: May form explosive peroxides. Irritating to eyes and respiratory system.
Safety Statements: Keep away from sources of ignition - no smoking. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Do not empty into drains. Take precautionary measures against static discharges. Wear suitable protective clothing.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: No
TSCA INVENTORY ITEM: Yes

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2007 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.