1. PRODUCT AND COMPANY IDENTIFICATION

Product name : Tetrahydrofuran

Product Number : 401757
Brand : Sigma-Aldrich
Product Use : For laboratory research purposes.

Supplier : Sigma-Aldrich
Manufacturer : Sigma-Aldrich Corporation
3050 Spruce Street
SAINT LOUIS MO  63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052
Emergency Phone # (For both supplier and manufacturer) : (314) 776-6555
Preparation Information : Sigma-Aldrich Corporation
Product Safety - Americas Region
1-800-521-8956

2. HAZARDS IDENTIFICATION

Emergency Overview

OSHA Hazards
Flammable liquid, Target Organ Effect, Harmful by ingestion., Irritant, Carcinogen

Target Organs
Central nervous system, Liver, Kidney

Other hazards which do not result in classification
May form explosive peroxides.

GHS Classification
Flammable liquids (Category 2)
Acute toxicity, Oral (Category 4)
Acute toxicity, Dermal (Category 5)
Skin irritation (Category 3)
Serious eye damage (Category 1)
Specific target organ toxicity - single exposure (Category 3)

GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)
H225 Highly flammable liquid and vapour.
H302 Harmful if swallowed.
H313 May be harmful in contact with skin.
H316 Causes mild skin irritation.
H318 Causes serious eye damage.
H335 + H336 May cause respiratory irritation, and drowsiness or dizziness.
Precautionary statement(s)
P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P280 Wear protective gloves/ eye protection/ face protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

HMIS Classification
Health hazard: 2
Chronic Health Hazard: *
Flammability: 3
Physical hazards: 3

NFPA Rating
Health hazard: 2
Fire: 3
Reactivity Hazard: 0

Potential Health Effects
Inhalation May be harmful if inhaled. Causes respiratory tract irritation. Vapours may cause drowsiness and dizziness.
Skin Harmful if absorbed through skin. Causes skin irritation.
Eyes Causes eye irritation.
Ingestion Harmful if swallowed.

3. COMPOSITION/INFORMATION ON INGREDIENTS

Synonyms THF
Formula : C4H8O
Molecular Weight : 72.11 g/mol

<table>
<thead>
<tr>
<th>CAS-No.</th>
<th>EC-No.</th>
<th>Index-No.</th>
<th>Concentration</th>
</tr>
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<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>203-726-8</td>
<td>603-025-00-0</td>
</tr>
</tbody>
</table>

4. FIRST AID MEASURES

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

If inhaled
If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

In case of skin contact
Wash off with soap and plenty of water. Consult a physician.

In case of eye contact
Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

If swallowed
Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

5. FIRE-FIGHTING MEASURES

Conditions of flammability
Flammable in the presence of a source of ignition when the temperature is above the flash point. Keep away from heat/sparks/open flame/hot surface. No smoking.

Suitable extinguishing media
Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters
Wear self contained breathing apparatus for fire fighting if necessary.
Hazardous combustion products
Hazardous decomposition products formed under fire conditions. - Carbon oxides

Further information
Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

Personal precautions
Use personal protective equipment. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

Methods and materials for containment and cleaning up
Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

7. HANDLING AND STORAGE

Precautions for safe handling
Avoid contact with skin and eyes. Avoid breathing vapors, mist or gas. Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

Conditions for safe storage
Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Components with workplace control parameters

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS-No.</th>
<th>Value</th>
<th>Control parameters</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tetrahydrofuran</td>
<td>109-99-9</td>
<td>TWA</td>
<td>50 ppm</td>
<td>USA. ACGIH Threshold Limit Values (TLV)</td>
</tr>
<tr>
<td>Remarks</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Central Nervous System impairment Upper Respiratory Tract irritation Kidney damage Confirmed animal carcinogen with unknown relevance to humans: The agent is carcinogenic in experimental animals at a relatively high dose, by route(s) of administration, at site(s), of histologic type(s), or by mechanism(s) that may not be relevant to worker exposure. Available epidemiologic studies do not confirm an increased risk of cancer in exposed humans. Available evidence does not suggest that the agent is likely to cause cancer in humans except under uncommon or unlikely routes or levels of exposure. Danger of cutaneous absorption</td>
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<tr>
<th>STEL</th>
<th>100 ppm</th>
<th>USA. ACGIH Threshold Limit Values (TLV)</th>
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<tr>
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<th>USA. OSHA - TABLE Z-1 Limits for Air Contaminants - 1910.1000</th>
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<tr>
<td></td>
<td>590 mg/m3</td>
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<tr>
<th>STEL</th>
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<tr>
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<td>735 mg/m3</td>
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<th>TWA</th>
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<th>USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants</th>
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</table>
The value in mg/m3 is approximate.

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<th>USA. NIOSH Recommended Exposure Limits</th>
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<tr>
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</tr>
<tr>
<td>ST</td>
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<td>735</td>
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</tbody>
</table>

**Personal protective equipment**

**Respiratory protection**
Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type AXBEK (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. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

**Hand protection**
Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove’s outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

**Eye protection**
Tightly fitting safety goggles. Faceshield (8-inch minimum). Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

**Skin and body protection**
Complete suit protecting against chemicals, Flame retardant antistatic protective clothing, The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

**Hygiene measures**
Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

**9. PHYSICAL AND CHEMICAL PROPERTIES**

**Appearance**
- **Form**: liquid, clear
- **Colour**: colourless

**Safety data**
- **pH**: no data available
- **Melting point/freezing point**: \(-108.0 \, ^\circ\text{C} (-162.4 \, ^\circ\text{F})\)
- **Boiling point**: 65.0 - 67.0 °C (149.0 - 152.6 °F)
- **Flash point**: \(-17.0 \, ^\circ\text{C} (1.4 \, ^\circ\text{F}) - closed cup\)
- **Ignition temperature**: 321 °C (610 °F)
- **Autoignition temperature**: 321.0 °C (609.8 °F)
- **Lower explosion limit**: 1.8 %(V)
- **Upper explosion limit**: 11.8 %(V)
- **Vapour pressure**: 152.0 hPa (114.0 mmHg) at 15.0 °C (59.0 °F)
  190.7 hPa (143.0 mmHg) at 20.0 °C (68.0 °F)
  213.3 hPa (160.0 mmHg) at 25.0 °C (77.0 °F)
  373.3 hPa (280.0 mmHg) at 38.0 °C (100.4 °F)
- **Density**: 0.89 g/cm³
- **Water solubility**: soluble
- **Partition coefficient: n-octanol/water**: log Pow: < 1
Viscosity, kinematic
0.512 mm²/s at 25 °C (77 °F)
0.403 mm²/s at 50 °C (122 °F)

Relative vapour density
no data available

Odour
no data available

Odour Threshold
no data available

Evaporation rate
no data available

10. STABILITY AND REACTIVITY

Chemical stability
Stable under recommended storage conditions.

Possibility of hazardous reactions
Vapours may form explosive mixture with air.

Conditions to avoid
Heat, flames and sparks. Extremes of temperature and direct sunlight.

Materials to avoid
Oxidizing agents, Oxygen

Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity

Oral LD50
LD50 Oral - rat - 1,650 mg/kg
LD50 Oral - guinea pig - 2,300 mg/kg

Inhalation LC50
LC50 Inhalation - rat - 3 h - 21000 ppm
Remarks: Drowsiness Lungs, Thorax, or Respiration: Respiratory stimulation. Ingestion may cause gastrointestinal irritation, nausea, vomiting and diarrhoea.

Dermal LD50
LD50 Dermal - rat - > 2,000 mg/kg

Other information on acute toxicity
no data available

Skin corrosion/irritation
Skin - rabbit - Mild skin irritation - Draize Test

Serious eye damage/eye irritation
Eyes - rabbit - Risk of serious damage to eyes. - Draize Test

Respiratory or skin sensitization
mouse - Did not cause sensitization on laboratory animals.

Germ cell mutagenicity
In vivo tests did not show mutagenic effects

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.
OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity
No toxicity to reproduction

Teratogenicity

no data available

**Specific target organ toxicity - single exposure (Globally Harmonized System)**
Inhalation - May cause respiratory irritation. May cause drowsiness or dizziness. - Nervous system

**Specific target organ toxicity - repeated exposure (Globally Harmonized System)**
The substance or mixture is not classified as specific target organ toxicant, repeated exposure.

Aspiration hazard
No aspiration toxicity classification

**Potential health effects**

<table>
<thead>
<tr>
<th>System</th>
<th>Effect</th>
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<td>Harmful if absorbed through skin. Causes skin irritation.</td>
</tr>
<tr>
<td>Eyes</td>
<td>Causes eye irritation.</td>
</tr>
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</table>

**Signs and Symptoms of Exposure**
Central nervous system depression, Cough, chest pain, Difficulty in breathing, Exposure to high airborne concentrations can cause anesthetic effects., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Synergistic effects
no data available

Additional Information
RTECS: LU5950000

12. ECOLOGICAL INFORMATION

**Toxicity**

<table>
<thead>
<tr>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toxicity to fish</td>
<td>LC50 - Pimephales promelas (fathead minnow) - 2,160 mg/l - 96 h</td>
</tr>
<tr>
<td>Toxicity to algae</td>
<td>Growth inhibition NOEC - Algae - 3,700 mg/l - 192 h</td>
</tr>
</tbody>
</table>

**Persistence and degradability**
Expected to be biodegradable

**Bioaccumulative potential**
no data available

**Mobility in soil**
no data available

**PBT and vPvB assessment**
no data available

**Other adverse effects**
no data available

13. DISPOSAL CONSIDERATIONS
Product
Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2056  Class: 3  Packing group: II
Proper shipping name: Tetrahydrofuran
Reportable Quantity (RQ): 1000 lbs
Marine pollutant: No
Poison Inhalation Hazard: No

IMDG
UN number: 2056  Class: 3  Packing group: II  EMS-No: F-E, S-D
Proper shipping name: TETRAHYDROFURAN
Marine pollutant: No

IATA
UN number: 2056  Class: 3  Packing group: II
Proper shipping name: Tetrahydrofuran

15. REGULATORY INFORMATION

OSHA Hazards
Flammable liquid, Target Organ Effect, Harmful by ingestion., Irritant, Carcinogen

SARA 302 Components
SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components
SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Massachusetts Right To Know Components

<table>
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<tr>
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Pennsylvania Right To Know Components

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New Jersey Right To Know Components

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California Prop. 65 Components
This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Further information
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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 Co., 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.