

# **MSDS – MATERIAL SAFETY DATA SHEET**

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## **TETRAHYDROFURAN**

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### **1. Product Identification**

**Synonyms:** Diethylene oxide, oxacyclopentane; THF; tetrahydrofuran and stabilizer; 1,4-Epoxybutane; Butylene Oxide; Cyclotetramethylene Oxide; Furan, tetrahydro

**CAS No.:** 109-99-9

**Molecular Weight:** 72.11

**Chemical Formula:** CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>CH<sub>2</sub>O

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### **2. Composition/Information on Ingredients**

Ingredient	CAS No	Percent Hazardous
Tetrahydrofuran	109-99-9	99 - 100% Yes

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### **3. Hazards Identification**

#### **Emergency Overview**

**DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY FORM EXPLOSIVE PEROXIDES. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.**

**SAFETY DATA** Ratings (Provided here for your convenience)

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Health Rating: 2 - Moderate (Life)

Flammability Rating: 3 - Severe (Flammable)

Reactivity Rating: 2 - Moderate

Contact Rating: 3 - Severe

Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD;  
PROPER GLOVES; CLASS B EXTINGUISHER

Storage Color Code: Red (Flammable)

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### **Potential Health Effects**

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**Inhalation:** Causes irritation to the respiratory tract. Symptoms may include coughing, shortness of breath. THF is an anesthetic agent in high concentrations. Overexposure may cause dizziness, headache, nausea and possible fluid in the lungs. May cause liver, kidney or lung injury.

**Ingestion:** Causes irritation to the gastrointestinal tract. Symptoms may include nausea, vomiting and diarrhea. May cause sore throat and abdominal pain. May cause liver or kidney injury.

**Skin Contact:** Causes irritation to skin. Symptoms include redness, itching, and pain.

**Eye Contact:** Causes irritation, redness, and pain. Contact may cause permanent eye damage.

**Chronic Exposure:** Repeated or high exposures may cause kidney or liver damage; may affect the lungs. Repeated skin exposure can cause dryness, cracking of skin and rash.

**Aggravation of Pre-existing Conditions:** Persons with pre-existing skin disorders or eye problems or impaired liver or kidney function may be more susceptible to the effects of the substance.

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## **4. First Aid Measures**

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

**Ingestion:** Induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention.

**Skin Contact:** Immediately flush skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

**Eye Contact:** Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

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## **5. Fire Fighting Measures**

**Fire:** Flash point: -14C (7F) CC

Autoignition temperature: 321C (610F)

Flammable limits in air % by volume:

lel: 2.0; uel: 11.8

Extremely Flammable Liquid and Vapor! Vapor may cause flash fire. Dangerous fire hazard when exposed to heat or flame.

**Explosion:**

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. May form explosive organic peroxides when exposed to air or light or with age. Vapors can flow along surfaces to distant ignition source and flash back. Sealed containers may rupture when heated.

**Fire Extinguishing Media:**

Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool.

**Special Information:**

In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Water spray may be used to keep fire exposed containers cool. Water may be used to flush spills away from exposures and to dilute spills to non-flammable mixtures. Vapors can flow along surfaces to distant ignition source and flash back.

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## 6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

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## 7. Handling and Storage

Store in dark glass bottles or steel drums. Protect against physical damage. Store in a cool, dry well-ventilated location, away from direct sunlight and any area where the fire hazard may be acute. Store in tightly closed containers (preferably under nitrogen atmosphere). Outside or detached storage is preferred. Inside storage should be in a standard flammable liquids storage room or cabinet. Separate from oxidizing materials. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment. Do not use compressed air for filling, discharging, or handling. Peroxides can be removed by treatment with strong ferrous sulfate solution made slightly acidic with sodium bisulfite. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause

injury or death. Do not allow to evaporate to near dryness unless absence of peroxides has been shown. Addition of appropriate reducing agents will lessen peroxide formation.

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## 8. Exposure Controls/Personal Protection

### **Airborne Exposure Limits:**

-OSHA Permissible Exposure Limit (PEL): 200 ppm (TWA).

-ACGIH Threshold Limit Value (TLV): 50 ppm (TWA), 100 ppm (STEL): A3  
Confirmed Animal Carcinogen with Unknown Relevance to Humans.

### **Ventilation System:**

A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices*, most recent edition, for details.

### **Personal Respirators (NIOSH Approved):**

If the exposure limit is exceeded and engineering controls are not feasible, a half-face organic vapor respirator may be worn for up to ten times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit, or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. **WARNING:** Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

### **Skin Protection:**

Rubber or neoprene gloves and additional protection including impervious boots, apron, or coveralls, as needed in areas of unusual exposure.

### **Eye Protection:**

Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

### **Other Control Measures:**

Odor threshold: 2 - 50 ppm

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## 9. Physical and Chemical Properties

**Appearance:** Colorless, mobile liquid.

**Odor:** Ether odor.

**Solubility:** Miscible in water.

**Specific Gravity:** 0.88 @ 20C/4C

**pH:** ca. 7

**% Volatiles by volume @ 21C (70F):** 100

**Boiling Point:** 66C (151F)  
**Melting Point:** -108C (-162F)  
**Vapor Density (Air=1):** 2.5  
**Vapor Pressure (mm Hg):** 129 @ 20C (68F)  
**Evaporation Rate (BuAc=1):** 8.0

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## 10. Stability and Reactivity

**Stability:** Stable in closed containers with oxygen and light excluded. Distillation or evaporation can concentrate peroxides (if present) to create an explosion hazard.

**Hazardous Decomposition Products:** Carbon dioxide and carbon monoxide may form when heated to decomposition. May also release toxic and irritating vapors.

**Hazardous Polymerization:** May occur.

**Incompatibilities:** Tetrahydrofuran reacts violently with air on standing. LiAlH<sub>2</sub>, strong oxidizers, NaAlH<sub>2</sub> and potassium hydroxide. Will attack some forms of plastics, rubbers and coatings.

**Conditions to Avoid:** Heat, flame, ignition sources, incompatibles, light, and air.

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## 11. Toxicological Information

### Toxicological Data:

Oral rat LD<sub>50</sub>: 1650 mg/kg. Inhalation rat LC<sub>50</sub>: 21,000 ppm/3H. Investigated as a tumorigen, mutagen, reproductive effector.

### Reproductive Toxicity:

Animal data show developmental effects only at exposures levels producing other toxic effects in the adult animal. Animal testing for reproductive effects show no change in reproductive performance.

### Carcinogenicity:

Under the National Toxicology Program (NTP), the Public Health Service completed a 2-year (lifetime) inhalation study in rats and mice on Tetrahydrofuran (THF) which suggests that THF is a carcinogen in laboratory animals. There is no data linking THF exposure to cancer in humans. The data shows carcinogenic activity in the liver and kidneys of laboratory animals.

Ingredient	---NTP Carcinogen---		
	Known	Anticipated	IARC Category
Tetrahydrofuran (109-99-9)	No	No	None

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## 12. Ecological Information

### **Environmental Fate:**

When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. This material is not expected to significantly bioaccumulate. When released into the air, this material may be removed from the atmosphere to a moderate extent by wet deposition.

### **Environmental Toxicity:**

96-hour LC50, fathead minnows: 2160 mg/L.

24 Hr EC50 Daphnia magna (Water flea): >10000 mg/L.

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## 13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

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## 14. Transport Information

### **Domestic (Land, D.O.T.)**

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**Proper Shipping Name:** TETRAHYDROFURAN

**Hazard Class:** 3

**UN/NA:** UN2056

**Packing Group:** II

**Information reported for product/size:** 2.5L

### **International (Water, I.M.O.)**

**Proper Shipping Name:** TETRAHYDROFURAN

**Hazard Class:** 3

**UN/NA:** UN2056

**Packing Group:** II

**Information reported for product/size:** 2.5L

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## 15. Regulatory Information

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-----\Chemical Inventory Status - Part 1\-----
Ingredient                               TSCA  EC   Japan Australia
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Tetrahydrofuran (109-99-9)           Yes  Yes   Yes   Yes
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-----\Chemical Inventory Status - Part 2\-----
Ingredient                               Korea  DSL   --Canada--
                                         NDSL  Phil.
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Tetrahydrofuran (109-99-9)           Yes   Yes   No    Yes
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-----\Federal, State & International Regulations - Part 1\-----
Ingredient                               -SARA 302-  -SARA 313-
                                         RQ   TPQ   List  Chemical Catg.
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Tetrahydrofuran (109-99-9)           No    No    No    No
```

Chemical Weapons Convention: No      TSCA 12(b): Yes      CDTA: Yes  
SARA 311/312: Acute: Yes      Chronic: No      Fire: Yes      Pressure: No  
Reactivity: Yes      (Pure / Liquid)

This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

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## 16. Other Information

**NFPA Ratings:** Health: **2** Flammability: **3** Reactivity: **1**

**Label Hazard Warning:** DANGER! EXTREMELY FLAMMABLE LIQUID AND VAPOR. VAPOR MAY CAUSE FLASH FIRE. MAY FORM EXPLOSIVE PEROXIDES. HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

**Label Precautions:** Keep away from heat, sparks and flame.

Keep container closed. Use only with adequate ventilation.

Avoid breathing vapor or mist. Avoid contact with eyes, skin and clothing.

Wash thoroughly after handling.

Do not allow to evaporate to near dryness unless absence of peroxides has been shown.

Addition of appropriate reducing agents will lessen peroxide formation.

**Label First Aid:** If swallowed, induce vomiting immediately as directed by medical personnel. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. In all cases, get medical attention.

**Product Use:**  
Laboratory Reagent.

**Revision Information:** No Changes.

**Disclaimer:**

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