

SAFETY DATA SHEET



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TETRAHYDROFURAN (INHIBITOR FREE)

SDS No. M0191

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: Tetrahydrofuran

Synonyms: Diethylene Oxide; 1,4-Epoxybutane; Butylene Oxide; Cyclotetramethylene Oxide; Oxacyclopentane; Tetramethylene Oxide; THT

Recommended Use: This product is recommended for laboratory and manufacturing use only. It is not recommended for drug, food or household use.

2. HAZARDS IDENTIFICATION



Classification:

Flammable Liquids: GHS Category 2

Acute Toxicity, Oral: GHS Category 4

Eye Irritation: GHS Category 2A

Carcinogenicity: Category 2

Specific Target Organ Exposure, single exposure: GHS Category 3

Label Elements

Signal Word: DANGER!

Hazard Statements:

H225 – Highly flammable liquid and vapor.

H302 – Harmful if swallowed.

H319 – Causes serious eye irritation.

H335 – May cause respiratory irritation.

H351 – Suspected of causing cancer.

Precautionary Statements:

P210 – Keep away from heat/sparks/open flames/hot surfaces. – No smoking.

P233 – Keep container tightly closed.

P241 – Use explosion-proof electrical/ventilating/lighting/equipment.

P243 – Take precautionary measures against static discharge.

P270 – Do not eat, drink, or smoke while using this product.

P280 – Wear protective gloves/protective clothing/eye protection/face protection.

Clear focus. Consistent results. Complete confidence.

P301+P312 - IF SWALLOWED: Call a POISON CENTER or a doctor/physician if you feel unwell.

P303+P361+P353 – If on skin or hair: Remove/take off immediately all contaminated clothing. Rinse skin with water/shower.

P304+P312 - IF INHALED: Call a POISON CENTER or doctor/physician if you feel unwell.

P305+P351+P338 - IF IN EYES: Rinse continuously with water for several minutes. Remove contact lenses if present and easy to do – continue rinsing.

Emergency Overview

Causes irritation to eyes, skin, and respiratory tract. Highly flammable liquid and vapor. Vapor may cause flash fire. May form explosive peroxides. Hygroscopic. Target Organs: Kidneys, central nervous system, liver, respiratory system, eyes, and skin.

HMIS Rating:

Health – 2 Flammability – 3 Physical Hazard – 0 PPE – User supplied

NOTE: HMIS ratings use a numbering scale that ranges from 0 - 4 to indicate the degree of hazard. A value of zero means the chemical presents no hazard while a value of four indicates a high hazard. These ratings are based on the inherent properties of this chemical under expected conditions of normal use and are not intended to be used in emergency situations. PPE is determined by the user based on their needs and conditions.

3. COMPOSITION AND INFORMATION ON INGREDIENTS

<u>Ingredient</u>	<u>CAS No</u>	<u>Percent</u>	<u>Hazardous</u>
Tetrahydrofuran	109-99-9	100%	Yes

4. FIRST-AID MEASURES

Inhalation: If inhaled, remove to fresh air. If breathing is labored or with coughing, give 100% supplemental oxygen. If not breathing, begin artificial respiration. Get medical aid.

Ingestion: If swallowed, get medical attention immediately; DO NOT induce vomiting unless directed by medical personnel. Never give anything by mouth to an unconscious person. If not breathing, begin artificial respiration. DO NOT give mouth-to-mouth resuscitation. Get medical aid.

Skin Contact: Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation persists. Wash clothing before reuse. Thoroughly clean shoes before reuse.

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

Notes to Physician: Treat symptomatically and supportively. Persons with skin problems or liver, kidney, lung, or blood diseases may at increased risk from exposure to this product.

5. FIRE FIGHTING MEASURES

Flammability: Highly flammable liquid and vapor (GHS Category 2)

Auto-ignition Temperature: 321° C (609° F)

Flash Point: -14° C (6° F)

Flammable Limits: Lower Limit – 2.0 vol %, Upper Limit – 11.8 vol %

Products of Combustion: May decompose into carbon monoxide and carbon dioxide in fire conditions.

Specific Fire Hazards: As in any fire, always wear self-contained breathing apparatus in pressure-demand (MSA/NIOSH approved or equivalent), and full protective gear. Use water spray to keep fire exposed containers cool. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.

Specific Explosion Hazards: Forms peroxides of unknown stability.

Fire Fighting Media: Water may be ineffective. Use dry chemical, carbon dioxide, or appropriate foam.

National Fire Protective Association: Health - 2, Flammability - 3, Reactivity - 0

NOTE: NFPA ratings use a numbering scale that ranges from 0 - 4 to indicate the degree of hazard. A value of zero means the chemical presents no hazard while a value of four indicates a high hazard. They are for use by emergency personnel to address the hazards that are presented by short term, acute exposure to this product under fire, spill, or similar emergencies. Ratings involve data and interpretations that may vary from company to company.

6. ACCIDENTAL RELEASE MEASURES

Use water spray to dilute into a non-flammable mixture. Avoid run-off into storm sewers and ditches which lead to waterways. Provide ventilation to the affected area and remove all ignition sources. Absorb spilled liquid with sorbent pads, socks, or other inert material such as vermiculite, sand, or earth. Approach the spill from upwind and pick up absorbed material and place it in a suitable container. Always use proper personal protective equipment as described in section 8.

7. HANDLING AND STORAGE

Precautions: Always use proper personal protective equipment as described in section 8. Wash thoroughly after handling. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Remove contaminated clothing and wash before reuse. Empty containers contain product residue (liquid and vapor) and can be dangerous. Keep container tightly closed and away from heat, spark, and flame. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks, or open flames. Use with adequate ventilation. Avoid breathing vapor or mist.

Storage: Keep away from heat, sparks, and flame in a flammables area. Store in a cool place in the original container and protect from sunlight and moisture. Keep under a nitrogen blanket. Keep from contact with oxidizing materials. Containers should be dated when opened and tested periodically for the presence of peroxides. Should crystals form in a peroxidizable liquid, peroxidation may have occurred and the product should be considered extremely dangerous. In this instance, the container should only be opened remotely by professionals. All peroxidizable substances should be stored away from heat and light and be protected from ignition sources.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls: Use explosion-proof ventilation equipment. Facilities storing or using the material should be equipped with eyewash station and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protection: Wear protective chemical goggles or appropriate eye protection. Use appropriate protective gloves and protective clothing to prevent skin exposure. A respiratory protection program that meets OSHA 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever possible. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Exposure Limits:

ACGIH – 50 ppm TWA; 100 ppm STEL; Skin – potential significant contribution to overall exposure by cutaneous route
 NIOSH – 200 ppm TWA; 590 mg/m³ TWA; 2000 ppm IDLH
 OSHA Final PELs – 200 ppm TWA; 590 mg/m³ TWA

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State and Appearance: Clear, colorless liquid.

Odor: Sweetish, ether like

Odor Threshold: 2-50 ppm

Molecular Formula: C₄H₈O

Molecular Weight: 72.11

Auto-ignition Temperature: 321° C (609° F)

Flash Point: -14° C (6° F)

Flammable Limits: Lower Limit – 2.0 vol %, Upper Limit – 11.8 vol %

pH: ~ 7 in aqueous solution.

Boiling Point: 66° C @ 760 mm Hg

Freezing/Melting Point: -108.5° C

Decomposition Temperature: Not available

Specific Gravity: 0.89 g/cm³
Vapor Density (Air=1): 2.5
Vapor Pressure: 145 mm Hg @ 25° C.
Evaporation Rate (Butyl acetate = 1): <1
Viscosity: 0.48 cP 20° C
Solubility: Soluble

10. STABILITY AND REACTIVITY

Stability: Under normal storage conditions, peroxidizable compounds can form and accumulate peroxides which may explode when subjected to heat or shock. This material is most hazardous when peroxide levels are concentrated by distillation or evaporation. THF should never be distilled to dryness.

Conditions to Avoid: Light, ignition sources, moisture, excess heat, evaporation to near dryness, confined spaces..

Incompatibility With Various Substances: Strong oxidizing agents, strong acids, oxygen, bromine, metal halides, lithium tetrahydroaluminate, borane, sodium aluminum hydride, sodium tetrahydroaluminate, caustic alkalis.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: May occur.

11. TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation, skin absorption, skin contact

Acute Exposure Hazards:

INHALATION HAZARD: High concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness, and coma. Vapors may cause dizziness or suffocation. Inhalation may cause coughing, irritation of the mucous membranes and respiratory tract, difficulty breathing, and loss of consciousness. Inhalation of vapors may cause abnormal liver function as detected by laboratory results (Dupont)

INGESTION HAZARD: May cause gastrointestinal irritation with nausea, vomiting, and diarrhea. May cause central nervous system depression.

SKIN CONTACT HAZARD: Causes skin irritation. May be absorbed into body causing symptoms similar to those of inhalation. THF is not a skin sensitizer in animals.

EYE CONTACT HAZARD: Contact with eyes may cause severe irritation and possible eye burns. Vapors may cause eye irritation. May cause reversible damage.

Chronic Exposure Hazards: Prolonged or repeated eye contact may cause conjunctivitis. Prolonged or repeated skin contact may cause defatting and dermatitis. May cause liver, kidney, and lung damage. Narcotic in high concentrations. Data shows carcinogenic activity in the liver and kidneys of lab animals. Kidney tumors were by a mechanism that has no relevance in humans.

Animal Toxicity:

Inhalation, rat: LC50 = 21,000 ppm/3H;

Oral, rat: LD50 = 1650 mg/kg;

Carcinogenicity: THF is listed by ACGIH as an animal carcinogen with unknown relevance to humans.

Epidemiology: No information found.

Teratogenicity: Animal data show developmental effects only at exposure levels producing other toxic effects in the adult animal.

Reproductive Effects: Animal testing for reproductive effects shows no change in reproductive performance.

Mutagenicity: THF has not produced damage in mammalian cell cultures or animals. It has not been tested for its ability to cause permanent genetic damage in reproductive cells of mammals (not tested for heritable genetic damage).

Neurotoxicity: No information available.

12. ECOLOGICAL INFORMATION

Ecotoxicity:

Fish: Fathead minnow: 2160 mg/L; 94 Hr; flow through bioassay (pH 7.5);

Water flea Daphnia: EC50 = 5930 mg/L; 24 Hr;

THF is not expected to adsorb to suspended matter in water based on its measured Koc values. This compound should volatilize from water surfaces. An estimated BCF value of 1 suggests that THF will not bioconcentrate in aquatic organisms.

Environmental Fate: If released to the atmosphere, tetrahydrofuran will exist solely in the vapor phase and is degraded in the atmosphere by reaction with photochemically-produced hydroxyl radicals and nitrate radicals with half-lives of about 1 and 3 days, respectively. Measured Koc values of 23 and 18 indicate that THF will have very high mobility in soil.

Special Remarks: Do not empty into drains.

13. DISPOSAL CONSIDERATIONS

Material that cannot be saved for recovery or recycling should be managed in an appropriate and approved waste facility. Processing, use or contamination of this product may change the waste management options. Waste generators must decide if discarded material is a hazardous waste. State and local disposal regulations may differ from federal disposal definitions found in 40 CFR 261.3. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. TRANSPORT INFORMATION

US DOT

Proper Shipping Name: Tetrahydrofuran

Hazard Class: 3

UN Number: UN2056

Packing Group: II

Reportable Quantity: 1000 lbs.

IMDG

Proper Shipping Name: Tetrahydrofuran

Hazard Class: 3

UN Number: UN2056

Packing Group: II

EMS No.: F-E, S-D

IATA

Proper Shipping Name: Tetrahydrofuran

Hazard Class: 3

UN Number: UN2056

Packing Group: II

15. REGULATORY INFORMATION

US Federal Regulations:

CERCLA Hazardous Substances: CAS# 109-99-9 – 1000 lb final RQ; 454 kg final RQ

SARA Section 302: Does not have a TPQ

SARA Codes: CAS# 109-99-9 – immediate, fire, reactive

Section 313: Tetrahydrofuran (CAS# 109-99-9) is not reportable under Section 313.

OSHA: Not considered highly hazardous by OSHA.

US State Regulations:

CAS# 109-99-9 is on the following state right-to-know lists: New Jersey, Pennsylvania, and Massachusetts.

California Prop 65: This product contains no chemicals known to the State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Originally Prepared: 4/11/2006

Last Revised: 6/2/2016 – Hazard information in Section 2 and Transportation information in Section 14 has been updated.

The information contained herein is based on current knowledge and experience; no responsibility is accepted that the information is sufficient or correct in all cases. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers and the protection of the environment.

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