

Material Safety Data Sheet

Tetrahydrofuran
MSDS Date: 02/1/2009

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Name:

Tetrahydrofuran

Manufacturer's Name and Address:

Penn A Kem
3324 Chelsea Avenue
Memphis, TN 38108
Emergency Number, if inside US: (901) 320 4003
Emergency Number, if outside US: (877) 895 7366

Synonyms: THF

Tetramethylene oxide

Stabilized THF

SECTION 2: Composition/Information on Ingredients

CAS NO.: 109-99-9
EINECS/ELINCS: 203-726-8
Chemical Name: tetrahydrofuran
Molecular Weight: 72.
Chemical Formula: C₄H₈O
Percent: 100.%

Note: This material is normally stabilized with an antioxidant, less than 0.04 wt%.

SECTION 3: Hazards Identification

Emergency Overview: This material is HAZARDOUS by OSHA Communication definition.
Signal Word: Danger.
NFPA Rating: Health: 2; Flammability: 3; Reactivity: 1
NHIS Rating: Health: 3; Flammability: 3; Reactivity: 1
Possible human carcinogen (NTP report 12/96)

Hazards: Clear, colorless liquid, ether-like odor.
Highly flammable. Avoid oxidizing agents. May be reactive if not inhibited. Avoid prolonged or repeated breathing of gases, vapors or mists. Severe skin irritant. Skin absorption hazard. Eye irritant. Central nervous system effects. Mucous membrane irritant. Irritating to gastrointestinal tract.

Potential Health Effects:

Eye: Eye irritant.
Skin: Skin irritant - defatting. Not expected to be a sensitizer.
Ingestion: Moderate ingestion hazard. May cause irritation of the digestive tract.
Inhalation: Causes narcotic effect in high concentration. May cause respiratory tract and mucous membrane irritation. May cause unconsciousness or respiratory arrest.

Chronic: Repeated or prolonged exposure may result in liver damage or may cause dermatitis by defatting the skin.

Target Organs: Skin, eye, central nervous system and liver.
Note: May aggravate pulmonary/bronchial disease and/or cause breathing difficulties.

SECTION 4: First Aid Measures

Eyes: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash skin thoroughly with mild soap and water. Wash clothing before reuse. Get medical aid if ill effects or irritation develops.

Ingestion: Do not induce vomiting. Never give anything by mouth to an unconscious person. If conscious and alert, rinse mouth and drink water. Get medical aid.

Inhalation: Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid if breathing difficulty persists.

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. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Cool containers with flooding quantities of water.
Extinguishing Media:	Small fire use water spray, dry chemical, carbon dioxide. Large fire use water spray, water fog dry chemical, carbon dioxide, or alcohol resistant foam. DO NOT USE SOLID WATER STREAM.
Flash Point:	6°F, -14°C
Auto ignition Temperature:	610°F, 321°C.
Explosion limits, Lower:	1.8
Upper:	11.8
NFPA Rating:	Health: 2; Flammability: 3; Reactivity: 1
NHIS Rating:	Health: 3; Flammability: 3; Reactivity: 1 Possible human carcinogen (NTP report 12/96)

SECTION 6: Accidental Release Measures

General Information:	Eliminate all sources of ignition. Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:	Absorb spill with inert non-combustible material (e.g. vermiculite, sand or earth), then place in a suitable container. Clean up spills immediately using non-sparking tools. Provide ventilation.

SECTION 7: Handling and Storage

Handling:	Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use with adequate ventilation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation. Handle empty containers with care. Vapor/residues may be flammable.
Storage:	Keep container closed when not in use. 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:	Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate ventilation and exhaust to keep airborne concentrations low.
Exposure Limits:	
Chemical name:	tetrahydrofuran
ACGIH:	50 ppm 8hrs/TWA 100 ppm 15 min/STEL
OSHA	200 ppm 8hrs/TWA

SECTION 8: Exposure Controls, Personal Protection Cont'd

Personal Protective Equipment:

- Eyes:** Wear appropriate protective eyeglasses or chemical safety goggles and face shield as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
- Hands:** Wear appropriate protective gloves to prevent skin exposure. Polyvinyl alcohol, Teflon, or 4H and Silver Shield brand. Butyl or natural rubber offer short term protection and should be removed and discarded when material is spilled on them.
- Clothing:** Wear appropriate protective clothing to prevent skin exposure.
- Respirators:** A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

SECTION 9: Physical and Chemical Properties

- Physical State:** Liquid
- Appearance:** Clear, colorless.
- Odor:** Ether-like odor.
- pH:** ~ 7.
- Vapor Pressure:** 155 mm Hg @ 25 °C (77 °F)
- Vapor Density:** 2.5
- Evaporation Rate:** Not available.
- Viscosity:** 0.5 mPa.s @ 25 °C
- Boiling Point:** 66 °C (151° F) at 760. mm Hg
- Freezing/Melting Point:** - 108. °C (-163 °F)
- Autoignition Temperature:** 321 C
- Solubility: water** Completely miscible.
- Specific Gravity/Density:** 0.888 g/cc.
- Molecular Formula:** C₄H₈O
- Molecular Weight:** 72

SECTION 10: Stability and Reactivity

- Chemical Stability:** Stable under normal temperatures and pressures so long as it is inhibited.
- Conditions to Avoid:** Incompatible materials, excess heat, strong oxidants. If unstabilized, avoid air and oxygen. Forms unstable peroxides with oxygen. Do not distill to dryness unless the material is tested for peroxides.
- Incompatibilities with other Materials:** Strong oxidizing agents.
- Hazardous Decomposition Products:** Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
- Hazardous Polymerization:** Polymerization can occur with very strong acids.

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SECTION 11: Toxicological Information

LD50 Oral rat 3240 mg/kg
LC50: Inhal rat 18,000 ppm 4 hr
Carcinogenicity: Not listed by IARC, NTP, OSHA or EPA.
Epidemiology: No information available.

Sensitization Not expected to be a skin sensitizer.

Eye Liquid and vapor is irritating to eyes.
Skin Severe skin irritant.

Teratogenicity: Not a teratogen.
Reproductive Effects: No effects on fertility or reproduction were found in rats administered high doses of tetrahydrofuran in drinking water. General systemic toxicity was evident in parental animals at high drinking water doses that were correlated with reduced body weights and developmental delays in the offspring.
Genetic toxicity: Negative for genotoxicity in vitro and in vivo tests..
Neurotoxicity: No information available.
Other Studies: No information available.

SECTION 12: Ecological Information

Acute toxicity fish LC50/96 hrs fathead minnow, 2,160 mg/l
Invertebrates EC50/24 hrs daphnia 5,930 mg/l
Aquatic plants NOEC /8 day algae 3,700 mg/l Not toxic to algae or higher aquatic plants.
Microorganisms No data available.
Other Studies: Biodegradation under aerobic conditions. Degrades abiotically in air..

SECTION 13: Disposal Considerations

Contaminated products, oil or water may be a US RCRA or OSHA hazardous waste due to a potentially low flash point. 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.

SECTION 14: Transport Information

US DOT	
Shipping Name: RQ	Tetrahydrofuran 1000 lb
Hazard Class:	Flammable liquid
UN Number:	UN2056
Packing Group:	II

International	
Shipping Name:	Tetrahydrofuran
Hazard Class:	Flammable liquid
UN Number:	UN2056
Packing Group:	II

SECTION 15: Regulatory Information

US FEDERAL:

TSCA (Toxic Substance Control Act): Tetrahydrofuran is listed on the TSCA inventory.

TSCA Section 12b: Tetrahydrofuran is listed under TSCA Section 12b. Export notification is required. TSCA section 4.

CERLA Hazardous Substances and Corresponding RQs: Tetrahydrofuran CAS 109-99-9 has an RQ of 1000 lb.

SARA Section 302 (Superfund Amendments and Reauthorizations Act):
SARA 311/312 Based on available information, tetrahydrofuran is classified as follows:
Immediate (Acute) Health Hazard
Delayed (Chronic) Health Hazard
Fire Hazard

313 Reportable Ingredients: None of the chemicals are reportable under Section 313.

Clean Air Act: This material does not contain any Class 1 Ozone depleters, or Class 2 Ozone depleters.

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

STATE:

Tetrahydrofuran CAS # 109-99-9 is present on state lists PA (hazardous substances and environmentally hazardous substances), MA (MSL, hazardous substance).

California Prop 65:

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:

Risk Phrases: R11– Highly Flammable.
R19 – May form explosive peroxides.
R36/37 – Irritating to eyes and respiratory system.

Safety Phrases:

- S 24/25, Avoid contact with skin and eyes.
- S 37, Wear suitable gloves.
- S 45, In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
- S 28A, In case of skin contact, wash immediately with plenty of water.

WGK (Water Danger/Protection):

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Canada – DSL/NDSL: This chemical is listed on the DSL list.

Canadian Ingredient Disclosure List: None.

SECTION 16: Additional Information

MSDS Creation Date: 05/1/2007

Revision #1 Date: 02/01/2009

The data contained herein is based on information currently available to Penn A Kem, and believed to be factual and the opinions expressed to be those of qualified experts; however, this data is not to be taken as a warranty or representation for which Penn A Kem assumes legal responsibility.