

CORCO CHEMICAL CORPORATION

Manufacturers of ACS Reagents and Semiconductor Grade Chemicals

SAFETY DATA SHEET

TETRAHYDROFURAN

1. IDENTIFICATION

Product identifier: TETRAHYDROFURAN

Product Code Number: 2501
Company Identification: Corco Chemical Corporation
299 Cedar Lane
Fairless Hills, PA 19030
Phone: 215-295-5006
Fax: 215-295-0781

24 Hour Emergency Telephone Number: CHEMTREC (U.S.): 1-800-424-9300
CHEMTREC (Outside U.S. 1-703-527-3887)

Trade Name: Tetrahydrofuran
Synonyms: Diethylene Oxide; 1,4-Epoxybutane;
Butylene Oxide; Cyclotetramethylene
Oxide; Oxacyclopentane;
Tetramethylene Oxide; THF
Chemical Formula: C₄H₈O
Product use: Process chemical, Laboratory and
scientific research and development

2. HAZARD(S) IDENTIFICATION

Physical hazards:	Flammable liquids	Category 2
Health hazards:	Acute toxicity, oral	Category 4
	Skin corrosion/irritation	Category 2
	Serious eye damage/eye irritation	Category 2A
	Carcinogenicity	Category 2

Specific target organ toxicity,
single exposure

Category 2
(nervous system)

Specific target organ toxicity,
single exposure

Category 3
respiratory tract
irritation

Specific target organ toxicity,
repeated exposure

Category 1
(kidney, liver,
nervous system)

OSHA hazard(s):

Not classified

Label Elements:



Signal word **Danger**

Hazard statement: Highly flammable liquid and vapor. Harmful if swallowed. Causes skin irritation. Causes serious eye irritation. May cause respiratory irritation. Suspected of causing cancer. May cause damage to organs (nervous system). Causes damage to organs (kidney, liver, nervous system) through prolonged or repeated exposure.

Precautionary statement: Prevention Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Use only outdoors or in a well-ventilated area. Keep container tightly closed. Use explosion-proof electrical/ventilating/lighting equipment. Ground/bond container and receiving equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe mist or vapor. Wash thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.

Response: In case of fire: Use appropriate media for extinction. Eliminate all ignition sources if safe to do so. **IF SWALLOWED:** Call a **POISON CENTER** or doctor/physician if you feel unwell. **If on skin (or hair):** Take off immediately all contaminated clothing. Rinse skin with water/shower. **If inhaled:** Remove person to fresh air and keep comfortable for breathing. **If in eyes:** Rinse cautiously with water

for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If exposed or concerned: Get medical advice/attention. Rinse mouth. If skin irritation occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention.

Storage: Store in a well-ventilated place. Keep container tightly closed. Store in a well-ventilated place. Keep cool. Store locked up.

Disposal: Dispose of contents/container to an approved incineration plant.

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.

3. Composition/information on ingredients

<u>Ingredient</u>	<u>CAS No</u>	<u>Percent</u>	<u>Hazardous</u>
Tetrahydrofuran	109-99-9	>99%	Yes
Butylated hydroxytoluene (BHT)	128-37-0	0.02 to 0.03%	Yes

4. First-aid measures

Inhalation: Move to fresh air. Call a POISON CENTER or doctor/physician if you feel unwell.

Skin contact: Take off immediately all contaminated clothing. Wash off with soap and plenty of water. If skin irritation occurs: Get medical advice/attention.

Eye contact: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention if irritation develops and persists.

Ingestion: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. Rinse mouth.

General information: In case of shortness of breath, give oxygen. Keep victim warm. Keep victim under observation. Symptoms may be delayed. Provide general supportive measures and treat symptomatically.

Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. IF exposed or concerned: Get medical advice/attention. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Flammability: Highly flammable liquid and vapor	(GHS Category 2)
Auto-ignition Temperature:	321o C (609o F)
Flash Point:	-14o C (6o 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 – 1.

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.

Fire-fighting equipment/instructions: In case of fire and/or explosion do not breathe fumes. Use standard firefighting procedures and consider the hazards of other involved materials. Move containers from fire area if you can do so without risk.

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.

Environmental precautions and Materials for Containment and Cleaning Up: 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! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802.

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 (THF):

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

Exposure Limits (BHT):

ACGIH – 2 mg/m³

TWA (inhalable fraction and vapor)

NIOSH – 10 mg/m³ TWA

OSHA Final PELs – None listed

General hygiene considerations: When using, do not eat, drink or smoke. Avoid contact with eyes. Avoid contact with skin. Wash hands before breaks and immediately after handling the product. Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State and Appearance:

Odor:

Odor Threshold:

Molecular Formula:

Molecular Weight:

Auto-ignition Temperature:

Flash Point:

Flammable Limits:

Flammability class:

Flash point class:

pH:

Boiling Point:

Freezing/Melting Point:

Decomposition Temperature:

Specific Gravity:

Vapor Density (Air=1):

Vapor Pressure:

Evaporation Rate (Butyl acetate = 1):

Viscosity:

Solubility:

Percent volatile:

Clear, colorless liquid.

Sweetish, ether like

2-50 ppm

C₄H₈O

72.11

321o C (609o F)

-14o C (6o F)

Lower Limit – 2.0 vol %,

Upper Limit – 11.8 vol %

Flammable IB estimated

Flammable IB

~ 7 in aqueous solution.

66 o C @ 760 mm Hg

-108.5 o C

Not available

0.89 g/cm³

2.5

145 mm Hg @ 25o C.

<1

0.48 cP 20o C

Soluble

100 %

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 and strong oxidizing agents.

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

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.

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.

Respiratory sensitization Due to lack of data the classification is not possible.

Animal Toxicity for THF:

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. BHT is not listed as a carcinogen.

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.

Skin sensitization Based on available data, the classification criteria are not met.

Germ cell mutagenicity Based on available data, the classification criteria are not met.

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.

Persistence and degradability:

None known

Bioaccumulative potential:

Not available

Partition coefficient:

n-octanol / water (log Kow)

0.46

Mobility in soil:

Not available

Other adverse effects:

Not available

13. Disposal considerations

Disposal instructions: Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Incinerate the material under controlled conditions in an approved incinerator. Do not incinerate sealed containers. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with

chemical or used container. If discarded, this product is considered a RCRA ignitable waste, D001. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations: Not available.

Hazardous waste code D001: Waste Flammable material with a flash point <140 F
Waste from residues / unused products: Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging: Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transportation Information

UN Number: UN2056

UN Proper Shipping Name: Tetrahydrofuran

Packing Group: II

DOT



IMDG / IATA



Transport hazard class(es):	3
Subsidiary class(es):	-
Packaging group:	II
Environmental hazards:	
Marine pollutant	No
Labels required:	Not available
EmS:	F-E, S-D
Special precautions for user	Not available
Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code	No information available

15. Regulatory information

US federal regulations All components are on the U.S. EPA TSCA Inventory List.
TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not on regulatory list.

CERCLA Hazardous Substance List (40 CFR 302.4)

TETRAHYDROFURAN (CAS 109-99-9) LISTED

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes

Delayed Hazard - Yes

Fire Hazard - Yes

Pressure Hazard - No

Reactivity Hazard - No

SARA 302 Extremely hazardous substance

No

SARA 311/312 Hazardous chemical

Yes

Other federal regulations:

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA)

Not regulated.

Drug Enforcement Administration (DEA). List 2, Essential Chemicals (21 CFR 1310.02(b) and 1310.04(f)(2) and Chemical Code Number

Not listed.

Drug Enforcement Administration (DEA). List 1 & 2 Exempt Chemical Mixtures (21 CFR 1310.12(c))

Not regulated.

DEA Exempt Chemical Mixtures Code Number

Not regulated.

Food and Drug Administration (FDA)

Not regulated.

US state regulations California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

US. Massachusetts RTK - Substance List

TETRAHYDROFURAN (CAS 109-99-9)

US. New Jersey Worker and Community Right-to-Know Act

Not regulated

US. Pennsylvania RTK - Hazardous Substances

TETRAHYDROFURAN (CAS 109-99-9)

US. Rhode Island RTK

TETRAHYDROFURAN (CAS 109-99-9)

US - California Proposition 65 - Carcinogens & Reproductive Toxicity (CRT):

Listed substance

Not listed

International Inventories:

<u>Country(s) or region</u>	<u>Inventory name</u>	<u>On inventory (yes/no)*</u>
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

16. Other information

Disclaimer - The information in the sheet was written based on the best knowledge and experience currently available. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text.