HCC ID: 110566-A25-011218

LYONDELL **Material Safety Data Sheet**

MSDS No.: BE286
Variant: U.S.A.-EN
Version No: 1.2
Validation Date: 12/19/2001

TETRAHYDROFURAN

SECTION 1: IDENTIFICATION

Product Name: TETRAHYDROFURAN

Product Number: 000000000000499269

Chemical Name: Tetrahydrofuran

CAS Number: 109-99-9

Chemical Family: Oxygen substituted cyclic hydrocarbons

Synonyms: Tetramethylene Oxide, THF

Manufacturer:
Lyondell Chemical Company
One Houston Center, Suite 1600
1221 McKinney St.
P.O. Box 2583
Houston Texas 77252-2583

Telephone Numbers:
Emergency: CHEMTREC 800 424-9300
LYONDELL 800-245-4532

Non-Emergency: CUSTOMER SERVICE
888 777-0232
PRODUCT SAFETY
800 700-0946

SECTION 2 : Composition/Information on Ingredients

Component Name:	CAS #:	EU Inventory Number:	Concentration by Wt./Mol% Avg.	Min.	Max.
Tetrahydrofuran	109-99-9	EINECS 203-726-8		99.0	
Butylated Hydroxy Toluene	128-37-0	EINECS 204-881-4			0.1

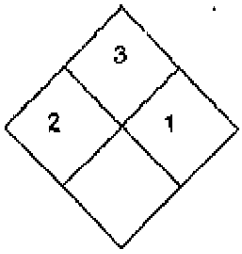
SECTION 3: HAZARD IDENTIFICATION

Emergency Overview This material is HAZARDOUS by OSHA Hazard Communication definition.

Signal Word: DANGER.

Hazards: Highly flammable. Avoid oxidizing agents. May be reactive if not inhibited. Avoid prolonged or repeated breathing of gases, vapors, or mists. Avoid prolonged or repeated contact with skin.

NFPA



HMIS®

Health	*	2
Flammability		3
Reactivity		1

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Physical State: Liquid.

Color: Clear, colorless.

Odor: Ether-like odor.

Potential Health Effects

Routes of Exposure: Inhalation Eye Skin.

Signs and Symptoms of Acute Exposure: See component summary.

- *Tetrahydrofuran* Causes narcotic effects in high concentrations. It may cause irritation to the respiratory tract and to other mucous membranes. Suspect eye irritant. Slight skin irritant - defatting action. Moderate ingestion hazard.
- *Butylated Hydroxy Toluene* Moderate skin irritant. Severe eye irritant.

Skin: Prolonged or repeated contact may cause skin to become dry or cracked. Causes dermatitis. Although no appropriate human or animal health effects data are known to exist, this material is not expected to be a health hazard by skin absorption.

Inhalation: Overexposure may cause coughing, shortness of breath, dizziness, intoxication and collapse. It may cause irritation to the respiratory tract and to other mucous membranes. Inhaling mist may produce signs of central nervous system involvement.

Eye: Although no appropriate human or animal health effects data are known to exist, this material is expected to cause eye irritation.

Ingestion: Swallowing this material may result in health hazard.

Chronic Health Effects: See component summary.

- *Tetrahydrofuran* Repeated or prolonged exposure may cause signs of central nervous system depression and respiratory irritation. This material has been shown to induce tumors in laboratory animals.
- *Butylated Hydroxy Toluene* No adverse chronic human health effects have been reported for this material.

Conditions Aggravated by Exposure: This material may aggravate pulmonary/bronchial disease and/or cause breathing difficulty.

SECTION 4: FIRST AID MEASURES

General: After adequate first aid, no further treatment is required unless symptoms reappear.

Inhalation: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain medical attention if breathing difficulty persists.

Eye: Immediately flush the eyes with large amounts of clean low-pressure water for at least 15 minutes, occasionally lifting the upper and lower lids. If pain or irritation persists, promptly obtain medical attention.

Skin: Promptly remove soiled clothing/wash thoroughly before reuse. Wash skin thoroughly with mild soap and water. If sticky, use waterless cleaner first. Seek medical attention if ill effect or irritation develops.

Ingestion: Do not induce vomiting. Risk of damage to lungs exceeds poisoning risk. If large quantity swallowed, give lukewarm water (pint/ 1/2 litre) if victim completely conscious/alert. Obtain emergency medical attention.

Physician's Detoxification Procedures: Treat symptomatically. Treatment of overexposure should be directed at the control of symptoms and the clinical condition of the patient.

SECTION 5: FIRE FIGHTING MEASURES

Flammability Classification: OSHA/NFPA Class IB Flammable Liquid.

Flash Point / Method: - -17 °C(1 °F)(TCC)

Auto-Ignition Temperature: 321 °C (610 °F)

Flammable Limits: **LOWER:** 2 vol%

UPPER: 11 vol%

Hazardous Combustion Products: Thermal decomposition may produce carbon monoxide and other toxic vapors.

Special Conditions to Avoid: Vapors may be heavier than air. When mixed with air and exposed to ignition source, vapors can burn in open or explode if confined. May travel long distances along the ground before igniting and flashing back to vapor source.

Extinguishing Media: **Suitable:** SMALL FIRE: Use dry chemicals, CO2, water spray or alcohol-resistant foam LARGE FIRE: Use water spray, water fog or alcohol-resistant foam

Unsuitable: Do not use solid water stream.

Fire Fighting Instructions: **Protective Equipment/Clothing:** Wear positive pressure self-contained breathing apparatus (SCBA). Structural firefighters protective clothing will only provide limited protection.

INSTRUCTIONS: Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Move containers form fire area if you can do it without risk. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. Always stay away from tanks engulfed in fire. For massive fire, use unmanned hose holders or monitor nozzles; if this is impossible, withdraw from area and let fire burn.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Release Response: Eliminate all sources of ignition. All equipment used when handling this product must be grounded. Do not touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors. Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers. Use clean non-sparking tools to

collect absorbed material.

Regulation	Component	TPQ	RQ
EPA/DOT RQ	Tetrahydrofuran / CAS# 109-99-9.		454 KG / 1,000 lbs

SECTION 7: HANDLING AND STORAGE

Handling: For Industrial use only. Keep container tightly closed when not in use. Extinguish all ignition sources. Wear recommended personal protective equipment. Containers must be properly grounded before beginning transfer. All electrical equipment should be grounded and conform to applicable electric codes and regulatory requirements. Check atmosphere for explosiveness and oxygen deficiencies. Observe precautions pertaining to confined space entry. Check periodically to confirm inhibitor content. If below desired level, add extra inhibitor/mix well to be effective. Use only non-sparking tools. Carefully vent any internal pressure before removing closure. Isolate, vent, drain, wash and purge systems or equipment before maintenance or repair. Handle empty containers with care; vapor/residue may be flammable.

Storage: Store closed drums with bung in up position. Store only in tightly closed, properly vented containers away from heat, sparks, open flame and strong oxidizing agents. Vapor space above stored liquid may be flammable/explosive unless blanketed with inert gas. Can self-react/polymerize/liberate heat/raising temperature, pressure/possibly rupture container unless properly inhibited.

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls: Electrical equipment should be grounded and conform to applicable electrical code. Provide local exhaust or general room ventilation to minimize exposure to vapors. Both local exhaust and good general room ventilation must be provided not only to control exposure but also to prevent formation of flammable mixtures.

Personal Protection:

Inhalation: If exposure can potentially exceed the exposure limit(s),respiratory protection recommended or approved by appropriate local, state or international agency must be used.

Skin: Depending on the conditions of use, protective gloves, apron, boots, head and face protection should be worn.

Eye: Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapor.

Other Hygienic Practices: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Wash hands before eating, drinking, smoking, or using toilet facilities.

Recommended Work Practices Use good personal hygiene practices. Promptly remove soiled clothing/wash thoroughly before reuse.

Occupational Exposure Limits:

Component Name:	Source / Date	Value / Units	Type	Notation	Carcinogenic Listing*
Tetrahydrofuran	US (ACGIH) / 2001	200 ppm 590 mg/m3	8 HRS / TWA	BEI	N/L

	US (ACGIH) / 2001	250 ppm	15 MIN / STEL.		
	US (OSHA) / 2001	200 ppm 590 mg/m3	8 HRS / TWA.	No	
Butylated Hydroxy Toluene	US (ACGIH) / 2001	2 mg/m3 (Inhalable fraction)	8 HRS / TWA.	No	
	US (OSHA) / 2001	N/L			

*1 = OSHA 2 = IARC 3 = NTP 4 = Others N/L = Not Listed See Section 11 for more information

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Density: No Data Available.

Boiling Point: ~ 65 °C/149 °F, @ 760 mm Hg

Vapor Pressure: ~ 155 mm Hg, @ (25 °C /77 °F)

Vapor: ~2.5, @ (25 °C/77 °F), (Air = 1.0)

pH: ~ 7

Viscosity: ~ 0.46 mPa.s, @ (25 °C/77 °F), (Brookfield).

Solubility: Solubility (Water):
Complete (In All Proportions).

Melting/ Freezing Point: ~ -108 °C/-163 °F

Dry Point: No Data Available.

Evaporation Rate: No Data Available.

Other Physical & Chemical Properties: Additional properties may be listed in Sections 3 and 5.

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability: This product is stable with an appropriate level of Butylated Hydroxy Toluene inhibitor (minimum 200 ppm), but reactive (unstable) without. Contact a company sales representative for information regarding adequate inhibitor levels and methods of making inhibitor level determinations.

Conditions to Avoid: Heat, sparks, open flame, other ignition sources, and oxidizing conditions.

Incompatibility with: Reacts vigorously with strong oxidizers and acids.

Decomposition Products: No additional information available.

Hazardous Polymerization: May occur.

Reactions with Air and Water: May form peroxides in the presence of air. May react with oxygen to form unstable peroxides. Peroxides are thermally unstable and shock sensitive.

SECTION 11: TOXICOLOGICAL INFORMATION

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Product Summary: See component summary.

Component Summary:
Tetrahydrofuran

LC50 (Inhl)

Rat	21,000 PPM	3 HOURS

Repeated Dose Toxicity The National Toxicology Program has reported that exposure of mice and rats to THF vapor levels up to 1800 ppm 6hr/day, 5 days/week for their lifetime caused an increased incidence of kidney tumors in male rats and liver tumors in female mice. The significance of these findings for human health are unclear at this time, and may be related to "species specific" effects. Elevated incidences of tumors in humans have not been reported for THF. Symptoms of respiratory tract irritation and damage to respiratory epithelium were reported in rats exposed to 5000 ppm of tetrahydrofuran for 90 days. Elevation of SGPT suggests a disturbance in liver function. The No Observed Effect Level (NOEL) was reported to be 200 ppm (JPN.J.Ind Health 24,379,1982). Tetrahydrofuran was not genotoxic in microbiological microorganisms (Cancer Research 39:682, 1979), drosophila (Env.Mut. 7:325,1985), or in the unscheduled DNA synthesis assays (Env.Mut. 5:482, 1983).

Butylated Hydroxy Toluene

LD50 (Oral)

Rat	890 MG/KG
Mouse	650 MG/KG

CARCINOGENICITY: When administered to rats by stomach tube, Butylated Hydroxy Toluene (BHT) produced tumors of the forestomach. On the basis of this information an International Agency for Research on Cancer (IARC) working group concluded that there is 'limited evidence' for the carcinogenicity of Butylated Hydroxy Toluene in laboratory animals. No case report or epidemiological study of carcinogenicity to humans was available to the working group; thus, no evaluation could be made of the carcinogenicity of Butylated Hydroxy Toluene to humans.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: This material is expected to be non-hazardous to aquatic species.

Toxicity to Fish:/Amphibians

Test type	Species	Value / Units
LC50 / 96 HOURS	fathead minnow	2,160 mg/l

Toxicity to Aquatic: Inverterbrates:

Test type	Species	Value / Units
EC50 / 24 HOURS	daphnia	5,930 mg/l

Toxicity to Aquatic: Plants

Test type	Species	Value / Units

NOEC / 48 HOURS	algae	225 mg/l

Environmental Fate: This material is volatile and water soluble. It may enter soil and may contaminate water. It is expected to be poorly adsorbed onto soils or sediments. This material is likely to evaporate from soil and water. Theo. BOD 100% (14 day).

Bioaccumulation: This material is not expected to bioaccumulate.

Biodegradation: This material is expected to be readily biodegradable.

SECTION 13: DISPOSAL CONSIDERATIONS

Contaminated product, soil or water may be hazardous waste due to potentially low flash point. Assure effluent complies with applicable regulations. Landfill solids at permitted sites. Use registered transporters. Burn concentrated liquids in systems compatible with water soluble wastes. Avoid flame-outs. Assure emissions comply with applicable regulations. Dilute aqueous waste may biodegrade. Avoid overloading/poisoning plant biomass. Contaminated product/soil/water may be U.S. Resource Conservation and Recovery Act (RCRA)/U.S. Occupational Safety and Health Administration (OSHA) hazardous waste due to potentially low flash point. (See 40 U.S. Code of Federal Regulations (CFR) 261 and 29 CFR 1910).

SECTION 14: TRANSPORT INFORMATION

Proper Shipping Name: Tetrahydrofuran

UN/NA ID: UN 2056

NAER Guidebook: 127

Marine Pollutant: No

Labels: Flammable liquid.

DOT Hazard Class: 3, PG II

IMDG Hazard Class: 3, PG II

ADR/VLG Hazard Class: 3

ICAO/IATA Hazard Class: 3, PG II

ADNR/VBG Hazard Class: 3

RID/VSG Hazard Class: 3

SECTION 15: REGULATORY INFORMATION

Regulatory Advisory: All components of this product are listed or are exempt from listing on the TSCA 8(b) inventory. If identified components of this product are listed under the TSCA 12(b) Export Notification rule, they will be listed below.

Regulatory Status: All components of this product are listed or are exempt from listing on the TSCA 8(b) inventory. If identified components of this product are listed under the TSCA 12(b) Export Notification rule, they will be listed below. Export notification required.

Tetrahydrofuran	TSCA Section 4

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SARA - Section 313 Emissions Reporting: The material does not contain any chemical components with known CAS numbers that exceed the De Minimis reporting levels established by SARA Title III, Section 313 and 40 CFR 372.

Component Summary: **Reporting Threshold**

SARA - Section 311/312: Based upon available information, this material is classified as the following health and/or physical hazards according to Section 311 & 312:

Immediate (Acute) Health Hazard.
Delayed (Chronic) Health Hazard.
Fire Hazard.

State Reporting:

- This material is not known to contain any chemicals with known CAS numbers that are currently listed as carcinogens or reproductive toxins under California Proposition 65 at levels which would be subject to the proposition. The Proposition 65 regulatory status of the remaining components of this material for which CAS numbers have not been established, has not been determined.

- A Volatile Organic Compound (VOC) is any volatile compound of carbon excluding methane, carbon monoxide, carbonic acid, metallic carbides or carbonates, ammonium carbonate, 1,1-trichloromethane, methylene chloride, (FC-23), (CFC-113), (CFC-22), (CFC-114), and (CFC-115). By this definition, this is a (VOC) material.

- Massachusetts Substances List (MSL) - Hazardous substances on the MSL must be identified when present in materials at levels greater than state specified criterion. The criterion is: >= 1%. Components with CAS numbers present in this material at a level which could require reporting under the statute are:

  Tetrahydrofuran / CAS# 109-99-9.

- Hazardous Substances listed by the State of Pennsylvania must be identified when present in materials at levels greater than the state specified criterion. The criterion is >= 1%. Components with CAS numbers in this material at a level which could require reporting under the statute are:

  Tetrahydrofuran / CAS# 109-99-9.

- Environmentally Hazardous Substances listed by the State of Pennsylvania must be identified when present in materials at levels greater than the state specified criterion. The criterion is >= 1%. Components with CAS numbers in this material at a level which could require reporting under the statute are:

  Tetrahydrofuran / CAS# 109-99-9.

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SECTION 16: OTHER INFORMATION

DISCLAIMER OF RESPONSIBILITY:

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Latest Revision(s): Revised Section(s): 14 Date of Revision: December 4 2001

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