

# ETHYL TERTIARY BUTYL ETHER

## SECTION 1: IDENTIFICATION

**Product Name:** ETHYL TERTIARY BUTYL ETHER

**Product Number:** 000000000000011582

**Internal ID:** 3251

**Chemical Family:** Alkyl ethers

**CAS Number:** 637-92-3

**Chemical Name:** Tert-Butyl Ethyl Ether

**Synonyms:** Tert-Butyl Ethyl Ether, ETBE-1 (Expected Composition in Ship/Vessel)

**Type of Use:** Octane enhancer

**Manufacturer**

Lyondell Chemie Nederland, B.V.  
Weenapoint D, Weena 762  
3014 DA Rotterdam The Netherlands

**Business Contact**

Service Center Europe 31 (0) 10 275 55 00



F

**24 Hour Emergency Contact**

Service Centre Europe 31 (0) 10 275 57 77

## SECTION 2 : COMPOSITION/INFORMATION ON INGREDIENTS

<u>Component Name</u>	<u>CAS #</u>	<u>EU Inventory</u>	<u>Concentration Wt.%*</u>	<u>Risk</u>	<u>Symbol</u>
Ethyl Tertiary Butyl Ether	637-92-3	211-309-7	83.0	None	None
t-Butyl Methyl Ether	1634-04-4	216-653-1	12.3	R11, R38	F, Xi
Ethyl alcohol	64-17-5	200-578-6	2.2	R11	F
tert-Butyl Alcohol	75-65-0	200-889-7	1.2	R11, R20	F, Xn

\* Concentration of gaseous products or materials is given in Mole %

Compositions given are typical values not specifications.

## SECTION 3: HAZARD IDENTIFICATION

### Emergency Overview

**Hazards**

Highly flammable. Complementary Information: May impart an unpleasant taste and odor in water.

**R-Phrases**

R11 - Highly flammable. R52 - Harmful to aquatic organisms.

**Physical State**

Liquid.

**Color**

Clear, colorless to slightly yellow.

**Odor**

Terpene-like odor.

**Odor Threshold**

13 ppm / Odor is not an adequate warning of potentially hazardous ambient air concentrations. May impart an unpleasant taste and odor in water. The odor threshold for ETBE detection in air approximately 13 ppm. The taste threshold for ETBE

# ETHYL TERTIARY BUTYL ETHER

in water is approximately 47 ppb.

## **Potential Health Effects**

### **Routes of Exposure**

Skin. Eye Inhalation

### **Signs and Symptoms of Acute Exposure**

See component summary.

- *Ethyl Tertiary Butyl Ether* 637-92-3

Overexposure may cause coughing, shortness of breath, dizziness, central nervous system depression, intoxication and collapse. May be irritating to the eyes. Slight - moderate skin irritant. Not expected to be a sensitizer. Not a skin absorption hazard. Ingestion of high doses may cause discomfort and irritation of the gastrointestinal tract and CNS depression (fatigue, dizziness and possibly loss of concentration, with collapse, coma and death in cases of severe over-exposure).

- *t-Butyl Methyl Ether* 1634-04-4

Eye irritant. Moderate skin irritant. Not a skin absorption hazard. Mucous membrane irritant. Overexposure may produce anesthetic or narcotic effects. Aspiration hazard.

- *Ethyl alcohol* 64-17-5

May cause eye and upper respiratory tract irritation. Short-term overexposure above 1,000 ppm by the inhalation route may cause central nervous system (CNS) effects such as headache and irritation of eyes, nose and throat. If continued for more than an hour additional CNS effects may occur such as: dizziness, drowsiness, loss of appetite, and an inability to concentrate. Gastrointestinal (stomach) effects may occur with symptoms such as nausea and vomiting.

- *tert-Butyl Alcohol* 75-65-0

Moderate to severe eye irritant. Mildly irritating to the skin but not a skin sensitizer. Breathing mist or vapors may cause mucous membrane or upper respiratory tract irritation. Overexposure may cause coughing, shortness of breath, dizziness, central nervous system depression, intoxication and collapse. Ingestion would likely cause gastrointestinal tract irritation. May produce symptoms of nervous system depression including headache, dizziness, nausea, loss of sense of balance, drowsiness, and visual disturbances.

### **Skin**

Slight - moderate skin irritant. Extensive/prolonged or repeated exposure to this material can result in significant absorption. Not expected to be a skin absorption hazard. Not expected to be a sensitizer.

### **Inhalation**

May be irritating to respiratory system. High vapor concentrations may cause central nervous system (CNS) depression with symptoms such as nausea, dizziness, weakness, headache, loss of coordination, loss of consciousness, coma and death.

### **Eye**

May cause mild eye irritation. Effects of eye irritation are reversible.

### **Ingestion**

This material may be a slight health hazard if ingested in large quantities. Ingestion of high doses may cause discomfort and irritation of the gastrointestinal tract and CNS depression (fatigue, dizziness and possibly loss of concentration, with collapse, coma and death in cases of severe over-exposure).

### **Chronic Health Effects**

See component summary.

- *Ethyl Tertiary Butyl Ether* 637-92-3

Prolonged or repeated breathing of high concentrations may cause symptoms of central nervous system depression. Symptoms include headache, dizziness, weakness, loss of coordination and sleep, and in extreme cases unconsciousness.

- *t-Butyl Methyl Ether* 1634-04-4

Breathing mist or vapors may cause mucous membrane or upper respiratory tract irritation. Prolonged exposure may produce anesthetic and narcotic effects. Repeated or prolonged contact with skin may cause defatting and drying of the skin which may result in dermatitis. Chronic animal toxicity studies exposing rats and mice to MTBE have been performed.

# ETHYL TERTIARY BUTYL ETHER

A description of these studies and an assessment of their results is presented elsewhere in this document. See section 11.

- *Ethyl alcohol 64-17-5*

Long-term exposure can also cause loss of appetite, weight loss, nervousness, memory loss, mental retardation and liver damage. May cause dermatitis by defatting the skin from prolonged or repeated contact. Alcoholic beverages are carcinogenic to humans. Ethanol is a developmental toxin and various effects have been associated with ethanol intake. Examples of chronic ethanol abuse effects include physical dependence, malnutrition, amnesia, dementia, somnolence, cardiac myopathy, hepatotoxicity, GI bleeding and pancreatitis. Combined exposure to ethanol and certain other chemicals may result in increased toxic effects.

- *tert-Butyl Alcohol 75-65-0*

Prolonged or repeated breathing of high concentrations may cause symptoms of central nervous system depression. May cause dermatitis by defatting the skin from prolonged or repeated contact. This material has been shown to induce tumors in laboratory animals. These findings are not likely relevant to humans. May be toxic to the developing embryo and fetus.

### Conditions Aggravated by Exposure

Any pre-existing disorders or diseases of the nervous system, respiratory system, skin, and eyes.

## SECTION 4: FIRST AID MEASURES

---

### General

Take proper precautions to ensure your own health and safety before attempting rescue and providing first aid. For specific information refer to the Emergency Overview in Section 3 of this MSDS.

### Skin

Immediately remove contaminated clothing. Wash skin thoroughly with mild soap and water. Flush with lukewarm water for 15 minutes. If sticky, use waterless cleaner first. Seek medical attention if ill effect or irritation develops.

### Inhalation

If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention. Prompt action is essential.

### 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.

### Ingestion

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

### Note to Physician

Continue to rinse eye with clean water for 20-30 minutes, retracting eyelids often. Contact ophthalmologist immediately. Treat symptomatically.

## SECTION 5: FIRE FIGHTING MEASURES

---

### Flammable Properties

#### Classification

Highly flammable liquid.

#### Flash Point:

~ -25 °C (-13 °F) (Estimated)

#### Auto-Ignition Temperature

~ 310 °C (590 °F)

#### Lower Flammable Limit

~ 1.42 vol% (Estimated)

# ETHYL TERTIARY BUTYL ETHER

**Upper Flammable Limit**

~ 10.08 vol% (Estimated)

**Extinguishing Media**

**Suitable:** SMALL FIRE: Use dry chemicals, CO<sub>2</sub>, water spray or alcohol-resistant foam LARGE FIRE: Use water spray, water fog or alcohol-resistant foam

**Unsuitable:** Do not use solid water stream.

**Protection of Firefighters**

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

**Fire Fighting Guidance:** Releases flammable vapors below normal ambient temperatures. When mixed with air and exposed to ignition source, vapors can burn in open or explode if confined. Flammable vapors may be heavier than air. May travel long distances along the ground before igniting and flashing back to vapor source. Fight fire from maximum distance or use unmanned hose holders or monitor nozzles. Cool containers with flooding quantities of water until well after fire is out. Move containers from fire area if you can do it without risk. 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.

**Hazardous Combustion Products:** Carbon Monoxide and other toxic vapors.

## 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.

This substance is highly volatile, partially water soluble and has only a minimal tendency to adhere to soil particles. Even small volumes can pose a threat to the environment and nearby water resources. Surface spills can reach groundwater through porous soil or cracked surfaces. All efforts should be made to prevent any leaks or spills, and to protect water resources. Where spills are possible, a comprehensive spill response plan should be developed and implemented. If a leak or spill reaches the groundwater, the groundwater may become contaminated. If the groundwater is a source of drinking water, the associated drinking water well(s) could become contaminated. This substance may impart an unpleasant taste and odor to water.

## SECTION 7: HANDLING AND STORAGE

---

**Handling**

Keep container tightly closed when not in use. It is recommended that any liquid product exposed to air not be highly concentrated by evaporation without first assuring that no peroxide is present. Alternately, positive steps should be taken to reduce any accumulated peroxides to a safe level before concentrating the liquid. Use only non-sparking tools. Carefully vent any internal pressure before removing closure. Containers must be properly grounded before beginning transfer. All equipment must conform to applicable electrical code. Handle empty containers with care; vapor residue may be flammable/explosive. Isolate, vent, drain, wash and purge systems or equipment before maintenance or repair. Extinguish all ignition sources. Check atmosphere for explosiveness and oxygen deficiencies. Wear recommended personal protective equipment. Observe precautions pertaining to confined space entry.

**Storage**

Store only in tightly closed, properly vented containers away from heat, sparks, open flame and strong oxidizing agents. Storage under nitrogen atmosphere is recommended to minimize possible formation of highly reactive peroxides. Vapor space above stored liquid may be flammable/explosive unless blanketed with inert gas. Store closed drums with bung in up position.

## SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

---

# ETHYL TERTIARY BUTYL ETHER

### Engineering Controls

Provide local exhaust or general room ventilation to minimize dust and/or vapor concentrations. Electrical equipment should be grounded and conform to applicable electrical code.

### Personal Protection

Inhalation If exposure exceeds the exposure limit(s), use respiratory equipment recommended or approved by appropriate local, state or international agency.

Skin Wear chemical resistant gloves such as: 4H(tm)(PE/EVAL). When skin contact is possible, protective clothing including gloves, apron, sleeves, boots, head and face protection should be worn. The equipment must be cleaned thoroughly after each use.

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

### Additional Remarks

Selection of appropriate personal protective equipment should be based on an evaluation of the performance characteristics of the protective equipment relative to the task(s) to be performed, conditions present, duration of use, and the hazards and/or potential hazards that may be encountered during use. Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove soiled clothing/wash thoroughly before reuse. Shower after work using plenty of soap and water.

### Occupational Exposure Limits

Component Name	Source / Date	Value	Type	Notation
Ethyl Tertiary Butyl Ether	US (ACGIH) / 2003	5 ppm	8 HRS/TWA	Skin.
	OEL (IT) / 2003	5 ppm	8 HRS/TWA	Skin.
	VLA (ES) / 2003	5 ppm	8 HRS/TWA	No
t-Butyl Methyl Ether	US (ACGIH) / 2003	50 ppm	8 HRS/TWA	No
	MAK (AT) / 2001	50 ppm	8 HRS/TWA	No
	MAK (AT) / 2001	100 ppm	15 MIN/STEL	No
	OEL (BE) / 1999	40 ppm	8 HRS/TWA	No
	ELV (FI) / 2002	50 ppm	8 HRS/TWA	No
	OEL (IT) / 2003	50 ppm	8 HRS/TWA	No
	MAC (NL) / 2003	50 ppm	8 HRS/TWA	No
	MAC (NL) / 2003	100 ppm	15 MIN/STEL	No
	VLA (ES) / 2003	40 ppm	8 HRS/TWA	No
	TLV (SE) / 2000	30 ppm	8 HRS/TWA	No
	TLV (SE) / 2000	60 ppm	15 MIN/STEL	No
SUVA (CH) / 2001	50 ppm	8 HRS/TWA	No	
SUVA (CH) / 2001	75 ppm	15 MIN/STEL	No	
HSE (UK) / 2002	25 ppm	8 HRS/TWA	No	
HSE (UK) / 2002	75 ppm	15 MIN/STEL	No	

# ETHYL TERTIARY BUTYL ETHER

Ethyl alcohol	US (ACGIH)	1,000 ppm	8 HRS/TWA	No
	MAK (AT)	1,000 ppm	8 HRS/TWA	No
	MAK (AT)	2,000 ppm	CEILING	No
	OEL (BE)	1,000 ppm	8 HRS/TWA	No
	MAK (DA)	1,000 ppm	8 HRS/TWA	No
	ELV (FI)	1,000 ppm	8 HRS/TWA	No
	ELV (FI)	1,300 ppm	15 MIN/STEL	No
	INRS (FR)	1,000 ppm	8 HRS/TWA	No
	INRS (FR)	5,000 ppm	15 MIN/STEL	No
	MAK (DE)	500 ppm	CEILING	No
	ELV (IE)	1,000 ppm	8 HRS/TWA	No
	OEL (IT)	1,000 ppm	8 HRS/TWA	No
	MAC (NL)	500 ppm	8 HRS/TWA	No
	ELV (NO)	500 ppm	8 HRS/TWA	No
	VLA (ES)	1,000 ppm	8 HRS/TWA	No
	TLV (SE)	500 ppm	8 HRS/TWA	No
	TLV (SE)	1,000 ppm	15 MIN/STEL	No
	SUVA (CH)	500 ppm	8 HRS/TWA	No
	SUVA (CH)	1,000 ppm	15 MIN/STEL	No
	HSE (UK)	1,000 ppm	8 HRS/TWA	No
tert-Butyl Alcohol	US (ACGIH)	100 ppm	8 HRS/TWA	No
	MAK (AT)	20 ppm	8 HRS/TWA	Skin.
	MAK (AT)	80 ppm	15 MIN/STEL	Skin.
	OEL (BE)	100 ppm	8 HRS/TWA	No
	MAK (DA)	50 ppm	8 HRS/TWA	Skin.
	INRS (FR)	100 ppm	8 HRS/TWA	No
	ELV (FI)	50 ppm	8 HRS/TWA	Skin.
	ELV (FI)	75 ppm	15 MIN/STEL	Skin.
	MAK (DE)	20 ppm	8 HRS/TWA	No
	MAK (DE)	80 ppm	15 MIN/STEL	No
	ELV (IE)	100 ppm	8 HRS/TWA	No
	ELV (IE)	150 ppm	15 MIN/STEL	No
	OEL (IT)	100 ppm	8 HRS/TWA	No

# ETHYL TERTIARY BUTYL ETHER

MAC (NL)	100 ppm	8 HRS/TWA	No
ELV (NO)	25 ppm	CEILING	No
PORTUGAL	N/L		
VLA (ES)	100 ppm	8 HRS/TWA	No
VLA (ES)	150 ppm	15 MIN/STEL	No
TLV (SE)	50 ppm	8 HRS/TWA	Skin.
TLV (SE)	75 ppm	15 MIN/STEL	Skin.
SUVA (CH)	20 ppm	8 HRS/TWA	No
SUVA (CH)	80 ppm	15 MIN/STEL	No
HSE (UK)	100 ppm	8 HRS/TWA	No
HSE (UK)	150 ppm	15 MIN/STEL	No
OEL (EL)	100 ppm	8 HRS/TWA	No
OEL (EL)	150 ppm	15 MIN/STEL	No

## SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

---

**Appearance:** Liquid. Clear, colorless to slightly yellow.

**Odor:** Terpene-like odor.

**Odor Threshold:** 13 ppm Odor is not an adequate warning of potentially hazardous ambient air concentrations. May impart an unpleasant taste and odor in water. The odor threshold for ETBE detection in air approximately 13 ppm. The taste threshold for ETBE in water is approximately 47 ppb.

**pH:** ~ 6.4

**Boiling Point/Boiling Range:** ~ 66.9 °C (152.42 °F) @ 760 mm Hg(Estimated)

**Freezing Point/Melting Point:** ~ -94 °C (-137.2 °F)

**Flash Point:** ~ -25 °C (-13 °F) (Estimated)

**Auto-ignition:** ~ 310 °C (590 °F)

**Flammability:** Highly flammable liquid.

**Lower Flammable Limit:** ~ 1.42 vol% (Estimated)

**Upper Flammable Limit:** ~ 10.08 vol% (Estimated)

**Explosive Properties:** No Data Available.

**Oxidizing Properties:** No Data Available.

**Vapor Pressure:** ~ 158 mm Hg @ 25 °C (77 °F)

**Evaporation Rate:** No Data Available.

**Relative Density:** ~ 0.77(Water = 1.0 at 4°C (39.2°F))

# ETHYL TERTIARY BUTYL ETHER

**Relative Vapor Density:** ~ 3.5 @ 15 - 32 °C (59 - 89.6 °F) (Air = 1.0)

**Viscosity:** ~ 0.4 mPa.s

**Solubility (Water):** ~ 2.3 g/l @ 20 °C (68 °F)

**Partition Coefficient (Kow):** Log Kow = 1.48 - 1.56 Estimated.

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

**Remarks:** Actual physical properties depend on ratio of MTBE to ETBE.

## SECTION 10: STABILITY AND REACTIVITY

---

### Chemical Stability

Stable.

### Conditions to Avoid

Heat, sparks, open flame, other ignition sources, and oxidizing conditions.

### Substances to Avoid

This material will decompose to ethanol and isobutylene in the presence of strong acids which could lead to the risk of closed containers rupturing. Strong alkalis. Strong oxidizing agents.

### Decomposition Products

Carbon Monoxide and other toxic vapors. Contact with strong acids can decompose this material and generate extremely flammable isobutylene.

### Hazardous Polymerization

Not expected to occur.

### Reactions with Air and Water

May react with oxygen to form peroxides.

## SECTION 11: TOXICOLOGICAL INFORMATION

---

### PRODUCT INFORMATION

---

#### Product Summary

Ethyl tert-butyl ether (ETBE) has low acute toxicity in experimental animals following oral, inhalation, or dermal exposure. Acute or repeated inhalation exposures of high doses may result in nervous system depression. Liver enlargement without evidence of structural damage was seen in mice after repeated exposure, while male rats exhibited sex- and species-specific kidney effects. ETBE is not selectively toxic to the fetus and does not adversely affect reproductive function. ETBE is not genotoxic. ETBE has not been tested for carcinogenicity, however it is metabolized to t-butanol which induced kidney tumors in male rats and thyroid tumors in female mice by mechanisms that most likely are not relevant to humans.

### COMPONENT INFORMATION

---

- *Ethyl Tertiary Butyl Ether* 637-92-3

#### Acute Toxicity - Lethal Doses

<u>LC50 (Inhl)</u>	Rat	> 1450 PPM (VAPOR)	4 HOURS
<u>LD50 (Oral)</u>	Rat	> 5000 MG/KG BWT	

# ETHYL TERTIARY BUTYL ETHER

LD50 (Skin) Rabbit > 2000 MG/KG BWT

## Irritation

Skin Slight - moderate skin irritant. No significant signs or symptoms indicative of any health hazard are expected to occur as a result of skin absorption exposure. Not expected to be a sensitizer.

Eye May cause minor eye irritation. Effects of eye irritation are reversible.

## Target Organ Effects

Skin. Eye. Respiratory system. Central nervous system.

## Repeated Dose Toxicity

Repeated exposure to high vapor concentrations may cause nervous system depression (fatigue, dizziness, and possibly loss of concentration, with collapse, coma and death in cases of severe over-exposure). Kidney effects specific to male rats (hyaline droplet nephropathy) and liver enlargement with no evidence of structural damage in mice were reported following repeated exposure to ETBE vapor.

## Reproductive Effects

In a preliminary reproductive toxicity study, no adverse effects on reproductive function were seen in male and female rats exposed orally to 1000 mg/kg bwt ETBE.

## Developmental Effects

ETBE is not selectively toxic to the fetus. No adverse developmental effects were reported in rats exposed to high concentrations (1000 mg/kg bwt) during pregnancy despite the occurrence of maternal toxicity (decreased maternal body weight gain).

## Genetic Toxicity

Negative for genotoxicity both in vitro and in vivo tests.

## Carcinogenicity

No laboratory animal carcinogenicity studies have been conducted for ETBE. ETBE is metabolized to t-butanol which induced benign kidney tumors in male rats and benign thyroid tumors in female mice. The t-butanol induced male rat kidney tumors occurred by an a-2u-globulin mode of action, a tumor mechanism not relevant for humans, and the mouse thyroid tumors are postulated to be related to thyroid hormone metabolism and are also not likely relevant to humans. ETBE is not listed as a carcinogen by OSHA, NTP, IARC or EPA.

- *t-Butyl Methyl Ether* 1634-04-4

## Acute Toxicity - Lethal Doses

LC50 (Inhl) Rat 23,800 - 39,800 4 HOURS  
PPM

LD50 (Oral) Rat 3800 MG/KG BWT

LD50 (Skin) Rabbit. > 10,000 MG/KG BWT

## Target Organ Effects

Skin. Eye. Respiratory system. CNS depressant.

## Repeated Dose Toxicity

No evidence of adverse systemic effects was seen in rodents exposed repeatedly to low concentrations of MTBE vapor, however higher exposures were associated with an accumulation of protein droplets in the kidney of male rats (a male rat-specific response), with liver enlargement (but no adverse histopathological lesions) in rats and mice of both sexes. A decreased incidence of cystic endometrial hyperplasia and changes in other estrogen-sensitive tissues were reported in female mice exposed to 28.6 mg/l (8,000 ppm) MTBE vapor, however serum estrogen levels and estrogen receptor functions were unaffected. There are inconsistent reports of minor subjective neurological symptoms in humans regularly exposed to low levels of MTBE vapor. It is unclear, however, if these are causally-related to MTBE or where triggered by its odor. Some individuals find the odor of MTBE objectionable (threshold for detection 0.0002 mg/l; 0.053 ppm).

## Reproductive Effects

# ETHYL TERTIARY BUTYL ETHER

No adverse effect on reproductive function or gonad histopathology seen in male and female rats exposed to 28.6 mg/l (8,000 ppm) MTBE vapor over two generations.

## Developmental Effects

MTBE is not selectively toxic to the fetus. No adverse developmental effects were reported in rabbits exposed to high concentrations during pregnancy, despite the occurrence of maternal toxicity (CNS effects, significantly lower food intake, significantly lower maternal body weight). Similar maternal signs were noted in mice exposed under similar conditions, however in this instance an increased incidence of cleft palate was apparent in the offspring. Cleft palate is a stress-related phenomenon in the mouse hence this observation was considered secondary to maternal toxicity in this species.

## Genetic Toxicity

MTBE has been tested extensively for genotoxic activity in a range of in vitro and in vivo tests. While the majority of results are negative, weak positive findings (consistent with the metabolism of MTBE to formaldehyde by S9 fraction in vitro) have been obtained with Salmonella typhimurium TA102 and L5178Y TK+/- mouse lymphoma cells. Consistently negative results have been obtained from in vivo tests, however, and indicate that formation of free formaldehyde in the body is negligible. Overall, the weight of evidence indicates that MTBE is not a genotoxin.

## Carcinogenicity

Studies in experimental animals have found only limited evidence for the carcinogenicity for MTBE, with tumors occurring in tissues or via mechanisms considered not relevant to humans. Female mice exposed by inhalation to up to 28.6 mg/l (8,000 ppm) MTBE vapor responded with an increased incidence of liver tumors, while male rats developed tumors in testis and kidney under similar conditions. Mechanistic studies have shown important differences in the disposition and fate of MTBE in rodents and humans, suggesting that these findings after long-term inhalation exposure are not indicative of a risk to health. Results are also available from a life-time study of non-standard design, which reported an increased incidence of combined lymphoma/leukemia in female rats given MTBE by gavage, however inadequacies in the design and reporting of this investigation limit confidence in the result. Critically, MTBE is not genotoxic indicating that a direct effect on DNA is unlikely. Listed by IARC as not classifiable as to its carcinogenicity to humans (Group 3). This listing is based on inadequate evidence in humans and limited evidence of carcinogenicity in experimental animals.

- Ethyl alcohol 64-17-5

## Acute Toxicity - Lethal Doses

<u>LC50 (Inhl)</u>	Rat	20000 PPM	10 HOURS
<u>LD50 (Oral)</u>	Rat	7060 MG/KG BWT	
<u>LDLo (Oral)</u>	Human	1400 MG/KG BWT	

## Irritation

Skin Defatting of the skin with irritation, dryness and cracking. Standard Draize skin test (rabbit) - Dose: 20 mg/24 hrs  
Reaction: Moderate

Eye Eye exposure to Ethanol generally causes transient pain, irritation, and reflex lid closure. A foreign-body sensation may persist for one to two days. Vapors produce transient stinging and tearing, but no apparent adverse effects. Transiently impaired preception of color may occur with acute ingestion or chronic alcoholism. Standard Draize eye test (rabbit) - Dose: 500 mg  
Reaction: Severe Dose: 500 mg/24 hrs  
Reaction: Mild

## Repeated Dose Toxicity

Exposure to over 1000 ppm may cause headache, drowsiness and lassitude, loss of appetite, inability to concentrate and irritation of the throat.

## Reproductive Effects

Excessive consumption of alcoholic beverages during pregnancy can cause fetal alcohol syndrome. The development of physical and mental manifestation in the offspring; it may also cause defects in the central nervous system, heart, kidney and limbs. Moderate consumption can be associated with reduced birthweight and behavioral defects, but effects generally have not been observed with an intake of about one drink per day.

## Carcinogenicity

# ETHYL TERTIARY BUTYL ETHER

The International Agency for Research on Cancer (IARC) has determined alcoholic beverages are carcinogenic to humans (Group 1) and the occurrence of malignant tumors of the oral cavity, pharynx, larynx, esophagus and liver is causally related to the consumption of alcoholic beverages in humans. The American Conference of Governmental Industrial Hygienists (ACGIH) list ethyl alcohol as an A4 - Not classifiable as a Human Carcinogen. These are agents, which cause concern that they are carcinogenic for humans, but which cannot be assessed conclusively because of a lack of data. Animal studies do not provide indications carcinogenicity which are sufficient to classify the agent into one of their other categories.

- *tert-Butyl Alcohol* 75-65-0

## Acute Toxicity - Lethal Doses

LC50 (Inhl) Rat > 14,100 PPM 4 HOURS

LD50 (Oral) Rat 2,733 MG/KG BWT

LD50 (Skin) Rabbit > 2000 MG/KG BWT

## Irritation

Skin May be irritating to the skin. No significant signs or symptoms indicative of any health hazard are expected to occur as a result of skin absorption exposure. Not expected to be a sensitizer.

Eye Neat liquid may produce moderate to severe, reversible eye irritation. Washing the eyes after 30 seconds did not significantly reduce the irritation.

## Target Organ Effects

Skin. Eye. Respiratory system. Central nervous system.

## Repeated Dose Toxicity

Subchronic and chronic administration of t-butanol in the drinking water of male rats at concentrations of 1.25 mg/ml (estimated at 90 mg/kg bwt and higher) resulted in kidney pathology. The kidney pathology is mediated through the a-2u-globulin mode of action. In male and female rats that received 90 mg/kg bwt and higher t-butanol, there was an increase in the severity of chronic progressive nephropathy, a disease not relevant for humans. In male and female mice at concentrations in drinking water of 10 mg/ml (~1000 mg/kg bwt), an increased incidence of thyroid follicular cell hyperplasia was observed, and at ~2000 mg/kg bwt, the mice exhibited an increased inflammation of the urinary bladder resulting in hyperplasia.

## Reproductive Effects

T-butanol had no effect on fertility in a one-generation screening study. At maternally toxic doses (1000 mg/kg), there were fewer live pups per litter and lower birth weight, which continued through gestation. No adverse effects on testes and ovary structure were seen in rats that received repeated high oral doses (up to 8200 mg/kg bwt). No studies assessing fertility effects are currently available.

## Developmental Effects

Results from studies in pregnant rats and mice indicate that t-butanol is not teratogenic but at high oral doses (1550 mg/kg bwt) produces embryo/fetotoxicity and developmental delay.

## Genetic Toxicity

Negative for genotoxicity both in vitro and in vivo tests.

## Carcinogenicity

In a drinking water study, t-butanol induced benign kidney tumors in male rats via an a-2u-globulin mode of action, a tumor mechanism not relevant to humans. In female mice, there was an increased incidence of benign thyroid tumors. t-Butanol is not classified as to carcinogenicity by OSHA, NTP, IARC or EPA.

## SECTION 12: ECOLOGICAL INFORMATION

---

### PRODUCT INFORMATION

---

## Ecotoxicity

# ETHYL TERTIARY BUTYL ETHER

This material is classified as harmful to invertebrates. This material is not classified as harmful or toxic to fish. See component summary.

## WGK

Not classified.

## Environmental Fate and Pathway

Expected to have high mobility in soils. Volatilization from moist soil surfaces may occur. Expected to volatilize rapidly from surface waters with an estimated half-life in a model river of 1.5 hours and in a model lake of 101 hours. May adsorb to suspended solids and sediment in water. Undergoes photo-oxidation with hydroxyl groups in air with a half-life of 17 hours. This substance presents a potential concern to groundwater supplies. Small amounts of this substance or gasoline blended with this substance may impart an unpleasant odor and taste to the groundwater, which can render such groundwater unsuitable for consumption. Therefore, care should be used when handling, storing or transferring this substance or gasoline blended with this substance to insure that such product is not released into the environment and is not allowed to migrate to groundwater. Because this substance has a low solubility in water and a relatively low organic carbon partitioning coefficient, every release into the environment has the potential for damaging groundwater supplies. Once in the groundwater, this substance is expected to migrate faster and farther than most other hydrocarbons and be present at the leading edge of a groundwater contaminant plume. This substance may not biodegrade as promptly as other gasoline constituents and may require additional and more costly remediation procedures.

## Persistence and Degradability

Biodegradation: Inherently biodegradable by adapted microorganisms under aerobic conditions. May biodegrade under anaerobic conditions.

Bioaccumulation: This material is not expected to bioaccumulate.

## Other Adverse Effects

This material does not adhere readily to soil particles and may travel rapidly and extensively in a groundwater plume. Therefore, groundwater remediation efforts may be difficult and extensive.

## COMPONENT INFORMATION

---

- *Ethyl Tertiary Butyl Ether* 637-92-3

### Ecotoxicity

#### Acute toxicity to fish

LC50 / 96 HOUR sheepshead minnow. > 2,500 mg/l

#### Acute toxicity to aquatic invertebrates

EC50 / 96 HOUR common shrimp (mysid) 37 mg/l

EC50 / 48 HOUR daphnia 110 mg/l

#### Toxicity to aquatic plants

EC50 / 72 HOUR green algae. 1,100 mg/l

#### Toxicity to microorganisms

Summary: No Data Available.

#### Chronic toxicity to fish

Summary: No Data Available.

# ETHYL TERTIARY BUTYL ETHER

## Chronic toxicity to aquatic invertebrates

Summary: No Data Available.

## Environmental Fate and Pathway

Expected to have high mobility in soils. Volatilization from moist soil surfaces may occur. Expected to volatilize rapidly from surface waters with an estimated half-life in a model river of 1.5 hours and in a model lake of 101 hours. May adsorb to suspended solids and sediment in water. Undergoes photo-oxidation with hydroxyl groups in air with a half-life of 17 hours.

## Persistence and Degradability

Biodegradation: Inherently biodegradable by adapted microorganisms under aerobic conditions. May biodegrade under anaerobic conditions.

Bioaccumulation: This material is not expected to bioaccumulate. BCF = 6.0 Log Kow = 1.48 - 1.56 (estimated).

- *t-Butyl Methyl Ether* 1634-04-4

## Ecotoxicity

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

### Acute toxicity to fish

LC50 / 96 HOURS fathead minnow 672 - 980 mg/l

LC50 / 96 HOUR rainbow trout. 887 mg/l

LC50 / 96 HOUR bluegill sunfish 1,054 mg/l

LC50 / 96 HOUR silverside minnow. 574 mg/l

LC50 / 96 HOUR sheepshead minnow. 1,358 mg/l

### Acute toxicity to aquatic invertebrates

EC50 / 48 HOUR Daphnia magna. 472 - 681 mg/l

LC50 / 48 HOUR waterflea. 340 mg/l

EC50 / 96 HOUR saltwater mysid. 136 - 187 mg/l

### Toxicity to aquatic plants

IC50 / 96 HOUR green algae (Selenastrum). 491 mg/l

### Toxicity to microorganisms

Summary: No Data Available.

### Chronic toxicity to fish

IC50 / 31 DAY fathead minnow 279 mg/l

### Chronic toxicity to aquatic invertebrates

NOEC50 / 28 DAY saltwater mysid. 26 mg/l

Summary: May pose slight chronic toxicity in specific invertebrates.

## Environmental Fate and Pathway

## ETHYL TERTIARY BUTYL ETHER

MTBE presents a potential concern to groundwater supplies. Small amounts (by some accounts in the below one part per billion range) of MTBE or gasoline blended with MTBE may impart an unpleasant and distasteful odor and taste to groundwater which can render such groundwater unsuitable for consumption. Therefore, care should be used when handling, storing or transferring MTBE or gasoline blended with MTBE to insure that such product is not released into the environment and is not allowed to migrate to groundwater. Because of its solubility in water (4.3%) and relatively low organic carbon partitioning coefficient ( $K_{oc}=11$ ), MTBE is mobile in soil and, accordingly, every release into the environment has the potential for damaging groundwater supplies. Once in the groundwater, MTBE tends to migrate faster and farther than most other hydrocarbons and is typically present at the leading edge of a groundwater contaminant plume. MTBE may not biodegrade as promptly as other gasoline constituents and may require additional and more costly remediation procedures. Other information regarding MTBE is available through the Chemical Abstracts Service, American Petroleum Institute publications, the U.S. Environmental Protection Agency and elsewhere.

### Mobility

Transport between environmental compartments: The atmosphere is the main environmental compartment for releases of MTBE. In water, volatilization will result in substantial losses to the atmosphere with a half-life of 5-6 days.

### Persistence and Degradability

Biodegradation: Two OECD 301D studies (closed bottle test) showed negligible (0-2%) biodegradation after 28 days. Not readily biodegradable under aerobic conditions. However, degradation has been observed in non-standard tests using pure- and mixed bacterial cultures.

Bioaccumulation: Log Kow (Fish) <3 This material is not expected to bioaccumulate.

### Other Adverse Effects

This material does not adhere readily to soil particles and may travel rapidly and extensively in a groundwater plume. Therefore, groundwater remediation efforts may be difficult and extensive. As a VOC, MTBE can contribute to the formation of photochemical smog in the presence of other VOC's.

- Ethyl alcohol 64-17-5

### **Ecotoxicity**

This material is not classified as harmful or toxic to fish. This material is not classified as harmful or toxic to algae or higher aquatic plants.

#### Acute toxicity to fish

LC50 / 96 HOUR rainbow trout. > 10,000 mg/l

Summary: Static and/or flow-through LC50(96-hr)= 13,000-15,300 mg/l

LC50 / 96 HOUR fathead minnow 15,300 mg/l

#### Toxicity to aquatic plants

Toxicity Threshold / green algae. 1,450 mg/l

Summary: growth inhibition

#### Toxicity to microorganisms

Toxicity Threshold / bacteria. 6,500 mg/l

Summary: Inhibition of cell multiplication begins.

### **Environmental Fate and Pathway**

When spilled on the land ethyl alcohol is apt to volatilize, biodegrade, and/or leach into the ground water. It is anticipated based on physical properties of ethyl alcohol including water solubility, vapor pressure, and octanol/water coefficient (log P=-0.31) that water will serve as the final media. Based on these factors it is anticipated that this substance will neither adsorb to soil nor bioconcentrate in aquatic organisms. Once in water photolysis, oxidation, hydrolysis, and biodegradation is anticipated to occur.

### Persistence and Degradability

Biodegradation: This material is expected to be biodegradable.

Bioaccumulation: This material is not expected to bioaccumulate.

# ETHYL TERTIARY BUTYL ETHER

- *tert-Butyl Alcohol* 75-65-0

## Ecotoxicity

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

### Acute toxicity to fish

LC50 / 96 HOUR fathead minnow > 961 mg/l

### Acute toxicity to aquatic invertebrates

EC50 / 48 HOUR waterflea. 5,504 mg/l

### Toxicity to aquatic plants

EC50 / green algae. > 976 mg/l

Summary: growth inhibition

### Toxicity to microorganisms

EC50 / bacteria. 11,263 mg/l

EC0 / bacteria. 13,560 mg/l

EC10 / 18 HOUR bacteria. 2,050 mg/l

### Chronic toxicity to fish

Summary: No Data Available.

### Chronic toxicity to aquatic invertebrates

Summary: No Data Available.

## Environmental Fate and Pathway

The product is volatile and will partition to air. Degraded in the atmosphere by reaction with photochemically produced hydroxyl radicals with an estimated half life ranging from 2.5 days to 25 days.

### Persistence and Degradability

Stability in Water: Not expected to volatilize from surface waters. Not likely to adsorb to suspended solids and sediment in water.

Stability in Soil: Expected to have high mobility in soils. Volatilization from dry soil surfaces is expected. Volatilization from moist soil surfaces is expected.

Biodegradation: This material is expected to be inherently biodegradable.

Bioaccumulation: BCF < 5 This material is not expected to bioaccumulate.

## SECTION 13: DISPOSAL CONSIDERATIONS

---

Contaminated product, soil, or water should be designated hazardous wastes due to potentially low flash point. Landfill solids at permitted sites. Use registered transporters. Burn concentrated liquids in systems designed for low flash point material. Assure emissions comply with applicable regulations. Avoid overloading/poisoning plant biomass. Assure effluent complies with applicable regulations.

## SECTION 14: TRANSPORT INFORMATION

---

### Special Requirements

If you reformulate or further process this material, you should consider re-evaluation of the regulatory status of the components listed in the composition section of this sheet, based on final composition of your product.

**Proper Shipping Name** ETHYL BUTYL ETHER

**ETHYL TERTIARY BUTYL ETHER**

ID No. UN1179

Hazard Class 3

PG II

**SECTION 15: REGULATORY INFORMATION****Regulatory Status**

Country	Inventory		
Australia	AICS	C	<b>X = All components are included or are otherwise exempt from inclusion on this inventory.</b>  <b>C = Contact Lyondell/Equistar by e-mail at <a href="mailto:product.safety@lyondell.com">product.safety@lyondell.com</a> or <a href="mailto:product.safety@equistarchem.com">product.safety@equistarchem.com</a> for additional information.</b>
Canada	DSL	C	
Canada	NDSL		
China	IECS	C	
European Union	EINECS	X	
European Union	ELINCS		
European Union	NLP		
Japan	ENCS	X	
Korea	ECL	X	
Philippines	PICCS	C	
United States	TSCA	X	

**Labeling Information****Symbol**

Highly Flammable

**R-Phrases**

R11 - Highly flammable.

R52 - Harmful to aquatic organisms.

**S-Phrases**

S16 - Keep away from sources of ignition - No Smoking.

S23 - Do not breathe gas/fumes/vapor/spray.

S29 - Do not empty into drains.

S33 - Take precautionary measures against static discharges.

**Other**

EU Labeling Information:

**SECTION 16: OTHER INFORMATION****Latest Revision(s)**

First Edition Date of Initial Preparation: May 4 2004

**DISCLAIMER OF RESPONSIBILITY**

This document is generated for the purpose of distributing health, safety, and environmental data. It is not a specification sheet nor should any displayed data be construed as a specification. The information on this MSDS was obtained from sources which we believe are reliable. However, the information is provided without any warranty, expressed or implied, regarding its correctness. Some information presented and conclusions drawn herein are from sources other than direct

## ETHYL TERTIARY BUTYL ETHER

test data on the substance itself. The conditions or methods of handling, storage, use and disposal of the product are beyond our control and may be beyond our knowledge. For this and other reasons, we do not assume responsibility and expressly disclaim liability for loss, damage, or expense arising out of or in any way connected with handling, storage, use, or disposal of this product. If the product is used as a component in another product, this MSDS information may not be applicable.

### Numerical Data Presentation

The presentation of numerical data, such as that used for physical and chemical properties and toxicological values, is expressed using a comma (,) to separate digits into groups of three and a period (.) as the decimal marker. For example, 1,234.56 mg/kg = 1 234,56 mg/kg

### Language Translations

The information presented in this document has been translated from English by a vendor Lyondell believes to be reliable. Lyondell and its vendor have made a good-faith effort to verify the accuracy of the translation, but assume no responsibility for any errors that may have occurred. Please refer to our web sites ([www.lyondell.com](http://www.lyondell.com) and [www.equistarchem.com](http://www.equistarchem.com)) for the original document written in English.

< end of document >