

TETRAHYDROFURAN

THF

CAUTIONARY RESPONSE INFORMATION

| | |
|---|---|
| Common Synonyms Diethylene oxide Tetramethylene oxide THF | Liquid Colorless Faint fruity odor Floats and mixes with water. Flammable, irritating vapor is produced. |
| <p>Keep people away. Shut off ignition sources and call fire department. Stay upwind and use water spray to "knock down" vapor. Avoid contact with liquid and vapor. Notify local health and pollution control agencies. Protect water intakes.</p> | |
| Fire | FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Wear goggles and self-contained breathing apparatus. Extinguish with dry chemical or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water. |
| Exposure | CALL FOR MEDICAL AID. VAPOR Irritating to eyes, nose and throat. If inhaled, will cause nausea, headache or loss of consciousness. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen. LIQUID Irritating to skin and eyes. Harmful if swallowed. Remove contaminated clothing and shoes. Flush affected areas with plenty of water. IF IN EYES, hold eyelids open and flush with plenty of water. IF SWALLOWED and victim is CONSCIOUS, have victim drink water or milk. |
| Water Pollution | Effect of low concentrations on aquatic life is unknown. May be dangerous if it enters water intakes. Notify local health and wildlife officials. Notify operators of nearby water intakes. |

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge

2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 41; Ether
- 2.2 Formula: CH2CH=CHCH2O
- 2.3 IMO/UN Designation: 3.1/2056
- 2.4 DOT ID No.: 2056
- 2.5 CAS Registry No.: 109-99-9
- 2.6 NAERG Guide No.: 127
- 2.7 Standard Industrial Trade Classification: 51659

3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment: Self-contained breathing apparatus; goggles or face shield; rubber or plastic gloves.
- 3.2 Symptoms Following Exposure: Vapors cause nausea, dizziness, headache, and anesthesia. Liquid can de-fat the skin and cause irritation. Liquid also irritates eyes.
- 3.3 Treatment of Exposure: INHALATION: remove victim from contaminated area; administer artificial respiration and oxygen if necessary. INGESTION: gastric lavage and saline cathartics are usually helpful; subsequent treatment is symptomatic and supportive. SKIN OR EYE CONTACT: wash with copious amounts of water.
- 3.4 TLV-TWA: 200 ppm
- 3.5 TLV-STEL: Not listed.
- 3.6 TLV-Ceiling: 250 ppm.
- 3.7 Toxicity by Ingestion: Grade 3; LD₅₀ = 50 to 500 mg/kg
- 3.8 Toxicity by Inhalation: Currently not available.
- 3.9 Chronic Toxicity: Currently not available.
- 3.10 Vapor (Gas) Irritant Characteristics: Vapors cause a slight smarting of the eyes or respiratory system if present in high concentrations. The effect is temporary.
- 3.11 Liquid or Solid Characteristics: Minimum hazard. If spilled on clothing and allowed to remain, may cause smarting and reddening of the skin.
- 3.12 Odor Threshold: 20-50 ppm
- 3.13IDLH Value: 2,000 ppm.
- 3.14 OSHA PEL-TWA: 200 ppm.
- 3.15 OSHA PEL-STEL: Not listed.
- 3.16 OSHA PEL-Ceiling: Not listed.
- 3.17 EPA AEGL: Not listed

4. FIRE HAZARDS

- 4.1 Flash Point: 6°F C.C. -4°F O.C.
- 4.2 Flammable Limits in Air: 1.8%-11.8%
- 4.3 Fire Extinguishing Agents: Dry chemical or carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used: Water may be ineffective.
- 4.5 Special Hazards of Combustion Products: Irritating vapor is generated when heated.
- 4.6 Behavior in Fire: May explode. Vapor is heavier than air and may travel considerable distance to a source of ignition and flash back.
- 4.7 Auto Ignition Temperature: 610°F
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: 4.7 mm/min.
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: 26.2 (calc.)
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): 8.0 (calc.)
- 4.14 Minimum Oxygen Concentration for Combustion (MOCC): Not listed

5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water: No reaction
- 5.2 Reactivity with Common Materials: No reaction
- 5.3 Stability During Transport: Stable unless 0.1% of peroxides has accumulated because of prolonged storage in presence of air. When concentrated by evaporation of solution, they explode.
- 5.4 Neutralizing Agents for Acids and Caustics: Not pertinent
- 5.5 Polymerization: Not pertinent
- 5.6 Inhibitor of Polymerization: 0.025% butylated hydroxytoluene (BHT) present to prevent peroxide formation.

6. WATER POLLUTION

- 6.1 Aquatic Toxicity: Currently not available
- 6.2 Waterfowl Toxicity: Currently not available
- 6.3 Biological Oxygen Demand (BOD): Currently not available
- 6.4 Food Chain Concentration Potential: None
- 6.5 GESAMP Hazard Profile:
Bioaccumulation: 0
Damage to living resources: 1
Human Oral hazard: 1
Human Contact hazard: 0
Reduction of amenities: 0

NOTES

7. SHIPPING INFORMATION

- 7.1 Grades of Purity: Currently not available
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: Padded
- 7.4 Venting: Pressure-vacuum
- 7.5 IMO Pollution Category: D
- 7.6 Ship Type: 3
- 7.7 Barge Hull Type: 3

8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Flammable liquid
- 8.2 49 CFR Class: 3
- 8.3 49 CFR Package Group: II
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification:

| Category | Classification |
|----------------------|----------------|
| Health Hazard (Blue) | 2 |
| Flammability (Red) | 3 |
| Instability (Yellow) | 0 |

- 8.6 EPA Reportable Quantity: 1000 pounds
- 8.7 EPA Pollution Category: C
- 8.8 RCRA Waste Number: U213
- 8.9 EPA FWCNA List: Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15°C and 1 atm: Liquid
- 9.2 Molecular Weight: 72.10
- 9.3 Boiling Point at 1 atm: 151°F = 66°C = 339°K
- 9.4 Freezing Point: -163.3°F = -108.5°C = 164.7°K
- 9.5 Critical Temperature: 512.6°F = 267.0°C = 540.2°K
- 9.6 Critical Pressure: 753 psia = 51.2 atm = 5.19 MN/m²
- 9.7 Specific Gravity: 0.888 at 20°C (liquid)
- 9.8 Liquid Surface Tension: 28 dynes/cm = 0.028 N/m at 20°C
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: Not pertinent
- 9.11 Ratio of Specific Heats of Vapor (Gas): (est.) 1.083
- 9.12 Latent Heat of Vaporization: 180 Btu/lb = 98 cal/g = 4.1 X 10³ J/kg
- 9.13 Heat of Combustion: -14,990 Btu/lb = -8330 cal/g = -348.8 X 10⁵ J/kg
- 9.14 Heat of Decomposition: Not pertinent
- 9.15 Heat of Solution: Not pertinent
- 9.16 Heat of Polymerization: Not pertinent
- 9.17 Heat of Fusion: Currently not available
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: 7.7 psia

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| 9.20 SATURATED LIQUID DENSITY | | 9.21 LIQUID HEAT CAPACITY | | 9.22 LIQUID THERMAL CONDUCTIVITY | | 9.23 LIQUID VISCOSITY | |
|----------------------------------|-----------------------|------------------------------|-------------------------------------|-------------------------------------|---|----------------------------|------------|
| Temperature (degrees F) | Pounds per cubic foot | Temperature (degrees F) | British thermal unit per pound-F | Temperature (degrees F) | British thermal unit inch per hour-square foot-F | Temperature (degrees F) | Centipoise |
| 35 | 56.750 | 0 | 0.372 | | N | | N |
| 40 | 56.560 | 10 | 0.376 | | O | | O |
| 45 | 56.370 | 20 | 0.380 | | T | | T |
| 50 | 56.180 | 30 | 0.384 | | P | | P |
| 55 | 55.990 | 40 | 0.388 | | E | | E |
| 60 | 55.800 | 50 | 0.392 | | R | | R |
| 65 | 55.610 | 60 | 0.397 | | I | | I |
| 70 | 55.420 | 70 | 0.401 | | N | | N |
| 75 | 55.230 | 80 | 0.405 | | E | | E |
| 80 | 55.040 | 90 | 0.409 | | N | | N |
| 85 | 54.850 | 100 | 0.413 | | E | | E |
| 90 | 54.650 | 110 | 0.417 | | N | | N |
| 95 | 54.460 | 120 | 0.422 | | E | | E |
| 100 | 54.270 | 130 | 0.426 | | N | | N |
| 105 | 54.080 | 140 | 0.430 | | E | | E |
| 110 | 53.890 | 150 | 0.434 | | N | | N |
| 115 | 53.700 | | | | E | | E |
| 120 | 53.510 | | | | N | | N |

| 9.24 SOLUBILITY IN WATER | | 9.25 SATURATED VAPOR PRESSURE | | 9.26 SATURATED VAPOR DENSITY | | 9.27 IDEAL GAS HEAT CAPACITY | |
|-----------------------------|-----------------------------------|----------------------------------|------------------------|---------------------------------|-----------------------|---------------------------------|-------------------------------------|
| Temperature (degrees F) | Pounds per 100 pounds of water | Temperature (degrees F) | Pounds per square inch | Temperature (degrees F) | Pounds per cubic foot | Temperature (degrees F) | British thermal unit per pound-F |
| M | 0 | 0.336 | 0 | 0.00491 | 100 | 0.375 | |
| I | 5 | 0.397 | 5 | 0.00574 | 120 | 0.384 | |
| S | 10 | 0.467 | 10 | 0.00668 | 140 | 0.393 | |
| C | 15 | 0.547 | 15 | 0.00774 | 160 | 0.402 | |
| I | 20 | 0.639 | 20 | 0.00895 | 180 | 0.411 | |
| B | 25 | 0.744 | 25 | 0.01031 | 200 | 0.420 | |
| L | 30 | 0.864 | 30 | 0.01185 | 220 | 0.428 | |
| E | 35 | 0.999 | 35 | 0.01357 | 240 | 0.437 | |
| | 40 | 1.153 | 40 | 0.01550 | 260 | 0.445 | |
| | 45 | 1.327 | 45 | 0.01766 | 280 | 0.454 | |
| | 50 | 1.522 | 50 | 0.02006 | 300 | 0.462 | |
| | 55 | 1.742 | 55 | 0.02273 | 320 | 0.470 | |
| | 60 | 1.988 | 60 | 0.02570 | 340 | 0.478 | |
| | 65 | 2.264 | 65 | 0.02898 | 360 | 0.486 | |
| | 70 | 2.571 | 70 | 0.03260 | 380 | 0.494 | |
| | 75 | 2.913 | 75 | 0.03660 | 400 | 0.501 | |
| | 80 | 3.293 | 80 | 0.04099 | 420 | 0.509 | |
| | 85 | 3.714 | 85 | 0.04580 | 440 | 0.516 | |
| | 90 | 4.180 | 90 | 0.05108 | | | |
| | 95 | 4.694 | 95 | 0.05684 | | | |
| | 100 | 5.261 | 100 | 0.06313 | | | |
| | 105 | 5.884 | 105 | 0.06999 | | | |
| | 110 | 6.568 | 110 | 0.07744 | | | |
| | 115 | 7.317 | 115 | 0.08552 | | | |
| | 120 | 8.137 | 120 | 0.09428 | | | |
| | 125 | 9.032 | 125 | 0.10380 | | | |