

1,2-BUTYLENE OXIDE

BTO

CAUTIONARY RESPONSE INFORMATION

Common Synonyms		Liquid	Colorless	Sharp odor
1-Butene oxide Butylene oxide Alpha-Butylene oxide 1,2-Epoxybutane		Mixes with water.		
<p>Restrict access. Evacuate. Shut off ignition sources. Call fire department. Avoid contact with liquid and vapor. Wear rubber overclothing (including gloves). Stay upwind. Use water spray to "knock down" vapor. Notify local health and pollution control agencies. Protect water intakes.</p>				
Fire	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Extinguish with dry chemicals, foam, or carbon dioxide. Water may be ineffective on fire. Cool exposed containers with water.</p>			
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR Irritating to eyes, nose and throat. If inhaled will cause coughing or difficult breathing. If in eyes, hold eyelids open and flush with plenty of water. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Will burn skin and eyes. If swallowed will cause nausea and vomiting. 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 and have victim induce vomiting. IF SWALLOWED and victim is UNCONSCIOUS OR HAVING CONVULSIONS, do nothing except keep victim warm.</p>			
Water Pollution	<p>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.</p>			

1. CORRECTIVE RESPONSE ACTIONS

Dilute and disperse
Stop discharge
Chemical and Physical Treatment: Burn

2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group:** 16; Alkylene oxide
2.2 Formula: C₄H₈O
2.3 IMO/UN Designation: Not listed
2.4 DOT ID No.: 3022
2.5 CAS Registry No.: 106-88-7
2.6 NAERG Guide No.: 127P
2.7 Standard Industrial Trade Classification: 51615

3. HEALTH HAZARDS

- 3.1 Personal Protective Equipment:** Clean protective clothing; rubber gloves; chemical worker's goggles; self-contained breathing apparatus
- 3.2 Symptoms Following Exposure:** Inhalation: intolerable odor and irritation; respiratory injury may occur at higher levels. Ingestion causes irritation of mouth and stomach. Contact with either liquid or vapor may cause burns of eyes. Liquid produces frostbite-type of skin burn if free to evaporate; if confined to skin, burn may cause skin sensitization; not readily absorbed in toxic amounts.
- 3.3 Treatment of Exposure:** INHALATION: if any ill effects occur, immediately remove person to fresh air and get medical help; if breathing stops, start artificial respiration. INGESTION: induce vomiting promptly and get medical help. EYES: promptly flush with plenty of water for at least 15 min. and get medical help. SKIN: promptly flush with plenty of water; remove all contaminated clothing and wash before reuse.
- 3.4 TLV-TWA:** Not listed
3.5 TLV-STEL: Not listed.
3.6 TLV-Ceiling: Not listed.
3.7 Toxicity by Ingestion: Grade 2; oral LD₅₀ = 1,410 mg/kg (rat)
3.8 Toxicity by Inhalation: Currently not available.
3.9 Chronic Toxicity: Currently not available
3.10 Vapor (Gas) Irritant Characteristics: Currently not available
3.11 Liquid or Solid Characteristics: Currently not available
3.12 Odor Threshold: Currently not available
3.13 IDLH Value: Not listed.
3.14 OSHA PEL-TWA: Not listed.
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:**
<-20°F O.C.
- 4.2 Flammable Limits in Air:** 1.5%-18.3%
- 4.3 Fire Extinguishing Agents:** Dry chemical, alcohol foam, carbon dioxide
- 4.4 Fire Extinguishing Agents Not to Be Used:** Water may be ineffective.
- 4.5 Special Hazards of Combustion Products:** Currently not available
- 4.6 Behavior in Fire:** Containers may explode in fire. Use water to cool container from safe distance.
- 4.7 Auto Ignition Temperature:** 959°F
- 4.8 Electrical Hazards:** Currently not available
- 4.9 Burning Rate:** Currently not available
- 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

7. SHIPPING INFORMATION

- 7.1 Grades of Purity:** Technical, 99%
- 7.2 Storage Temperature:** Ambient
- 7.3 Inert Atmosphere:** No requirement
- 7.4 Venting:** Pressure-vacuum
- 7.5 IMO Pollution Category:** C
- 7.6 Ship Type:** 3
- 7.7 Barge Hull Type:** Currently not available

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)..... | 2 |
- 8.6 EPA Reportable Quantity:** 1000 pounds
- 8.7 EPA Pollution Category:** C
- 8.8 RCRA Waste Number:** U213
- 8.9 EPA FWPCA List:** Not listed

5. CHEMICAL REACTIVITY

- 5.1 Reactivity with Water:** Exothermic polymerization.
- 5.2 Reactivity with Common Materials:** Incompatible with acids, bases, oxidizers, and water.
- 5.3 Stability During Transport:** Stable
- 5.4 Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 Polymerization:** May occur when in contact with strong acids or bases
- 5.6 Inhibitor of Polymerization:** Currently not available

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 Physical State at 15° C and 1 atm:** Liquid
- 9.2 Molecular Weight:** 72
- 9.3 Boiling Point at 1 atm:** 145°F = 63°C = 336°K
- 9.4 Freezing Point:** <-58°F = <-50°C = <223°K
- 9.5 Critical Temperature:** Currently not available
- 9.6 Critical Pressure:** Currently not available
- 9.7 Specific Gravity:** 0.826 at 25°C (liquid)
- 9.8 Liquid Surface Tension:** Currently not available
- 9.9 Liquid Water Interfacial Tension:** Not pertinent
- 9.10 Vapor (Gas) Specific Gravity:** 2.49
- 9.11 Ratio of Specific Heats of Vapor (Gas):** Currently not available
- 9.12 Latent Heat of Vaporization:** (est.) 180 Btu/lb = 100 cal/g = 4.2 X 10⁵ J/kg
- 9.13 Heat of Combustion:** -15,200 Btu/lb = -8,470 cal/g = -354 X 10⁵ J/kg
- 9.14 Heat of Decomposition:** Not pertinent
- 9.15 Heat of Solution:** Not pertinent
- 9.16 Heat of Polymerization:** Currently not available
- 9.17 Heat of Fusion:** Currently not available
- 9.18 Limiting Value:** Currently not available
- 9.19 Reid Vapor Pressure:** 5.8 psia

NOTES

1,2-BUTYLENE OXIDE

BTO

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
52	52.430		N		N	52	0.458
54	52.360		O		O	54	0.453
56	52.290		T		T	56	0.448
58	52.220					58	0.443
60	52.150		P		P	60	0.438
62	52.080		E		E	62	0.433
64	52.010		R		R	64	0.428
66	51.940		T		T	66	0.423
68	51.870		I		I	68	0.419
70	51.800		N		N	70	0.414
72	51.730		E		E	72	0.410
74	51.660		N		N	74	0.405
76	51.600		T		T	76	0.401
78	51.530					78	0.397
80	51.460					80	0.393
82	51.390					82	0.388
84	51.320					84	0.384
86	51.250					86	0.381

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
68	7.000	55	3.099	55	0.04039		N
		60	3.425	60	0.04421		O
		65	3.779	65	0.04831		T
		70	4.161	70	0.05269		
		75	4.573	75	0.05737		P
		80	5.017	80	0.06236		E
		85	5.496	85	0.06768		R
		90	6.010	90	0.07333		T
		95	6.561	95	0.07934		I
		100	7.151	100	0.08571		N
		105	7.783	105	0.09245		E
		110	8.459	110	0.09959		N
		115	9.179	115	0.10710		T
		120	9.947	120	0.11510		
		125	10.760	125	0.12350		
		130	11.630	130	0.13230		
		135	12.550	135	0.14160		
		140	13.530	140	0.15140		
		145	14.570	145	0.16160		
		150	15.670	150	0.17240		
		155	16.830	155	0.18360		