

BUTANE

BUT

CAUTIONARY RESPONSE INFORMATION

Common Synonyms n-Butane	Liquefied compressed gas Colorless Gasoline-like odor
Floats and boils on water. Flammable, visible vapor cloud is formed.	
<p>Restrict access. Evacuate. 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	<p>FLAMMABLE. Flashback along vapor trail may occur. Vapor may explode if ignited in an enclosed area. Stop flow of gas if possible. Cool exposed containers and protect men effecting shut-off with water. Let fire burn.</p>
Exposure	<p>CALL FOR MEDICAL AID.</p> <p>VAPOR If inhaled, will cause dizziness or difficult breathing. Not irritating to eyes, nose or throat. Move to fresh air. If breathing has stopped, give artificial respiration. If breathing is difficult, give oxygen.</p> <p>LIQUID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.</p>
Water Pollution	<p>Not harmful to aquatic life. May be dangerous if it enters water intakes. Notify operators of nearby water intakes.</p>

1. CORRECTIVE RESPONSE ACTIONS

Stop discharge
Chemical and Physical Treatment: Burn

2. CHEMICAL DESIGNATIONS

- 2.1 CG Compatibility Group: 31; Paraffin
- 2.2 Formula: n-C₄H₁₀
- 2.3 IMO/UN Designation: 2.0/1011
- 2.4 DOT ID No.: 1011
- 2.5 CAS Registry No.: 106-97-8
- 2.6 NAERG Guide No.: 115
- 2.7 Standard Industrial Trade Classification: 51114

3. HEALTH HAZARDS

- 3.1 **Personal Protective Equipment:** Self-contained breathing apparatus and safety goggles.
- 3.2 **Symptoms Following Exposure:** High exposure produces drowsiness but no other evidence of systemic effect.
- 3.3 **Treatment of Exposure:** ORAL AND ASPIRATION: No treatment required. INHALATION: Guard against self-injury if stuporous, confused, or anesthetized. Apply artificial respiration if not breathing. Avoid administration of epinephrine or other sympathomimetic amines. Prevent aspirations of vomitus by proper positioning of the head. Give symptomatic and supportive treatment.
- 3.4 **TLV-TWA:** 800 ppm
- 3.5 **TLV-STEL:** Not listed.
- 3.6 **TLV-Ceiling:** Not listed.
- 3.7 **Toxicity by Ingestion:** Not pertinent
- 3.8 **Toxicity by Inhalation:** Currently not available.
- 3.9 **Chronic Toxicity:** None
- 3.10 **Vapor (Gas) Irritant Characteristics:** None
- 3.11 **Liquid or Solid Characteristics:** No appreciable hazard. Practically harmless to the skin because it is very volatile and evaporates quickly from the skin. Some frostbite possible.
- 3.12 **Odor Threshold:** 6.16 ppm
- 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:** -76°F C.C.
- 4.2 **Flammable Limits in Air:** 1.8%-8.4%
- 4.3 **Fire Extinguishing Agents:** Stop flow of gas
- 4.4 **Fire Extinguishing Agents Not to Be Used:** Not pertinent
- 4.5 **Special Hazards of Combustion Products:** Not pertinent
- 4.6 **Behavior in Fire:** Not pertinent
- 4.7 **Auto Ignition Temperature:** 550°F
- 4.8 **Electrical Hazards:** Class 1, Group D
- 4.9 **Burning Rate:** 7.9 mm/min.
- 4.10 **Adiabatic Flame Temperature:** 2435. (Est.)
- 4.11 **Stoichiometric Air to Fuel Ratio:** 30.9 (calc.)
- 4.12 **Flame Temperature:** Currently not available
- 4.13 **Combustion Molar Ratio (Reactant to Product):** 9.0 (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
- 5.4 **Neutralizing Agents for Acids and Caustics:** Not pertinent
- 5.5 **Polymerization:** Not pertinent
- 5.6 **Inhibitor of Polymerization:** Not pertinent

6. WATER POLLUTION

- 6.1 **Aquatic Toxicity:** None
- 6.2 **Waterfowl Toxicity:** None
- 6.3 **Biological Oxygen Demand (BOD):** None
- 6.4 **Food Chain Concentration Potential:** None
- 6.5 **GESAMP Hazard Profile:** Not listed.

7. SHIPPING INFORMATION

- 7.1 **Grades of Purity:** Research: 99.95%; Pure: 99.4%; Technical: 97.6%
- 7.2 **Storage Temperature:** Ambient
- 7.3 **Inert Atmosphere:** No requirement
- 7.4 **Venting:** Safety relief
- 7.5 **IMO Pollution Category:** Currently not available
- 7.6 **Ship Type:** 2
- 7.7 **Barge Hull Type:** Currently not available

8. HAZARD CLASSIFICATIONS

- 8.1 **49 CFR Category:** Flammable gas
- 8.2 **49 CFR Class:** 2.1
- 8.3 **49 CFR Package Group:** Not pertinent
- 8.4 **Marine Pollutant:** No
- 8.5 **NFPA Hazard Classification:**

Category	Classification
Health Hazard (Blue).....	1
Flammability (Red).....	4
Instability (Yellow).....	0
- 8.6 **EPA Reportable Quantity:** Not listed.
- 8.7 **EPA Pollution Category:** Not listed.
- 8.8 **RCRA Waste Number:** Not listed
- 8.9 **EPA FWPCA List:** Not listed

9. PHYSICAL & CHEMICAL PROPERTIES

- 9.1 **Physical State at 15° C and 1 atm:** Gas
- 9.2 **Molecular Weight:** 58.12
- 9.3 **Boiling Point at 1 atm:** 31.1°F = -0.48°C = 272.72°K
- 9.4 **Freezing Point:** -216°F = -138°C = 135°K
- 9.5 **Critical Temperature:** 305.6°F = 152°C = 425.2°K
- 9.6 **Critical Pressure:** 550.8 psia = 37.47 atm = 3.796 MN/m²
- 9.7 **Specific Gravity:** 0.60 at 0°C (liquid)
- 9.8 **Liquid Surface Tension:** 14.7 dynes/cm = .0147 N/m at 0°C
- 9.9 **Liquid Water Interfacial Tension:** (est.) 65 dynes/cm = 0.065 N/m at 22°C
- 9.10 **Vapor (Gas) Specific Gravity:** 2 at 20°C
- 9.11 **Ratio of Specific Heats of Vapor (Gas):** 1.092
- 9.12 **Latent Heat of Vaporization:** 170 Btu/lb = 92 cal/g = 3.9 X 10⁵ J/kg
- 9.13 **Heat of Combustion:** -19,512 Btu/lb = -10,840 cal/g = -453.85 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:** 19.18 cal/g
- 9.18 **Limiting Value:** Currently not available
- 9.19 **Reid Vapor Pressure:** 52.4 psia

NOTES

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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
-110	41.940	-30	0.535		N	-110	0.535
-100	41.630	-20	0.542		O	-105	0.511
-90	41.320	-10	0.550		T	-100	0.489
-80	41.000	0	0.557			-95	0.468
-70	40.690	10	0.564		P	-90	0.449
-60	40.380	20	0.571		E	-85	0.431
-50	40.070	30	0.578		R	-80	0.414
-40	39.750				T	-75	0.398
-30	39.440				I	-70	0.383
-20	39.130				N	-65	0.369
-10	38.820				E	-60	0.356
0	38.510				N	-55	0.344
10	38.190				T	-50	0.332
20	37.880					-45	0.321
30	37.570					-40	0.311
						-35	0.301
						-30	0.292
						-25	0.283
						-20	0.275
						-15	0.267
						-10	0.260
						-5	0.253
						0	0.246
						5	0.239
						10	0.233
						15	0.227

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
	I	-90	0.420	-90	0.00616	0	0.360
	N	-80	0.624	-80	0.00890	25	0.377
	S	-70	0.905	-70	0.01257	50	0.392
	O	-60	1.283	-60	0.01739	75	0.408
	L	-50	1.784	-50	0.02358	100	0.424
	U	-40	2.435	-40	0.03142	125	0.439
	B	-30	3.269	-30	0.04119	150	0.454
	L	-20	4.320	-20	0.05320	175	0.468
	E	-10	5.629	-10	0.06778	200	0.483
		0	7.237	0	0.08525	225	0.497
		10	9.192	10	0.10600	250	0.511
		20	11.540	20	0.13030	275	0.525
		30	14.340	30	0.15860	300	0.539
		40	17.640	40	0.19120	325	0.552
		50	21.510	50	0.22850	350	0.565
		60	25.990	60	0.27080	375	0.578
		70	31.160	70	0.31850	400	0.591
		80	37.080	80	0.37200	425	0.603
						450	0.615
						475	0.628
						500	0.639
						525	0.651
						550	0.663
						575	0.674
						600	0.685