

# CARBON DIOXIDE

CDO

## CAUTIONARY RESPONSE INFORMATION

<b>Common Synonyms</b> Carbonic acid gas Carbonic anhydride		Liquefied compressed gas or solid	Colorless gas or white solid	Odorless
Solid sinks and boils in water. Visible vapor cloud is produced.				
<b>KEEP PEOPLE AWAY. AVOID CONTACT WITH LIQUID AND SOLID.</b> Wear goggles, self-contained breathing apparatus, and rubber overclothing (including gloves).				
<b>Fire</b>	Not flammable. Containers may explode in fire. Cool exposed containers with water.			
<b>Exposure</b>	Call for medical aid.  VAPOR If inhaled will cause dizziness, or difficult breathing. Move victim to fresh air. If breathing is difficult, give oxygen.  LIQUID OR SOLID Will cause frostbite. Flush affected areas with plenty of water. DO NOT RUB AFFECTED AREAS.			
<b>Water Pollution</b>	Not harmful to aquatic life.			

<b>1. CORRECTIVE RESPONSE ACTIONS</b> Dilute and disperse Stop discharge	<b>2. CHEMICAL DESIGNATIONS</b> 2.1 CG Compatibility Group: Not listed. 2.2 Formula: CO <sub>2</sub> 2.3 IMO/UN Designation: 2/1013 2.4 DOT ID No.: 1013 2.5 CAS Registry No.: 124-38-9 2.6 NAERG Guide No.: 120 2.7 Standard Industrial Trade Classification: 52329
<b>3. HEALTH HAZARDS</b>	
<p>3.1 <b>Personal Protective Equipment:</b> Self-contained breathing apparatus in excessively high CO<sub>2</sub> concentration areas. For handling liquid or solid, wear safety goggles or face shield, insulated gloves, long-sleeved shirt, and trousers worn outside boots or over high-top shoes to shed spilled liquid.</p> <p>3.2 <b>Symptoms Following Exposure:</b> Inhalation causes increased respiration rate, headache, subtle physiological changes for up to 5% concentration and prolonged exposure. Higher concentrations can cause unconsciousness and death. Solid can cause cold contact burns. Liquid or cold gas can cause freezing injury to skin or eyes similar to a burn.</p> <p>3.3 <b>Treatment of Exposure:</b> INHALATION: move victim to fresh air. SKIN: treat burns from contact with solid in same way as frostbite.</p> <p>3.4 TLV-TWA: 5000 ppm 3.5 TLV-STEL: Not listed. 3.6 TLV-Ceiling: 30,000 ppm 3.7 Toxicity by Ingestion: Not pertinent (gas with low boiling point) 3.8 Toxicity by Inhalation: Currently not available. 3.9 Chronic Toxicity: None 3.10 Vapor (Gas) Irritant Characteristics: Currently not available 3.11 Liquid or Solid Characteristics: Currently not available 3.12 Odor Threshold: Odorless 3.13 IDLH Value: 40,000 ppm 3.14 OSHA PEL-TWA: 5,000 ppm 3.15 OSHA PEL-STEL: Not listed. 3.16 OSHA PEL-Ceiling: Not listed. 3.17 EPA AEGL: Not listed</p>	

## 4. FIRE HAZARDS

- 4.1 Flash Point: Not flammable
- 4.2 Flammable Limits in Air: Not flammable
- 4.3 Fire Extinguishing Agents: Not pertinent
- 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: Containers may explode when heated.
- 4.7 Auto Ignition Temperature: Not pertinent
- 4.8 Electrical Hazards: Not pertinent
- 4.9 Burning Rate: Not pertinent
- 4.10 Adiabatic Flame Temperature: Currently not available
- 4.11 Stoichiometric Air to Fuel Ratio: Not Pertinent
- 4.12 Flame Temperature: Currently not available
- 4.13 Combustion Molar Ratio (Reactant to Product): Not Pertinent
- 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: 100-200 mg/l/Various organisms/LC<sub>50</sub>/fresh water
- 6.2 Waterfowl Toxicity: Inhalation 5-8%, no effect
- 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: 99.995+%; Instrument: 99.99+%; Bone Dry: 99.95+%; Commercial: 99.5+%
- 7.2 Storage Temperature: Ambient
- 7.3 Inert Atmosphere: No requirement
- 7.4 Venting: Liquid-safety relief; solid-open
- 7.5 IMO Pollution Category: Currently not available
- 7.6 Ship Type: Currently not available
- 7.7 Barge Hull Type: 3

## 8. HAZARD CLASSIFICATIONS

- 8.1 49 CFR Category: Nonflammable gas
- 8.2 49 CFR Class: 2.2
- 8.3 49 CFR Package Group: Not pertinent.
- 8.4 Marine Pollutant: No
- 8.5 NFPA Hazard Classification: Not listed
- 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: 44.0
- 9.3 Boiling Point at 1 atm: Not pertinent (sublimes)
- 9.4 Freezing Point: -109.3°F = -78.5°C = 194.7°K
- 9.5 Critical Temperature: 87.8°F = 31°C = 304.2°K
- 9.6 Critical Pressure: 1.070 psia = 72.9 atm = 7.40 MN/m<sup>2</sup>
- 9.7 Specific Gravity: 1.56 at -79°C (solid)
- 9.8 Liquid Surface Tension: Not pertinent
- 9.9 Liquid Water Interfacial Tension: Not pertinent
- 9.10 Vapor (Gas) Specific Gravity: 1.53
- 9.11 Ratio of Specific Heats of Vapor (Gas): 1.0474
- 9.12 Latent Heat of Vaporization: 150 Btu/lb = 83 cal/g = 3.5 X 10<sup>5</sup> J/kg
- 9.13 Heat of Combustion: Not pertinent
- 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: 43.2 cal/g
- 9.18 Limiting Value: Currently not available
- 9.19 Reid Vapor Pressure: Currently not available

## 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
	N o D a t a		N O T  P E R T I N E N T	10 15 20 25 30 35 40 45 50 55 60 65 70 75 80 85 90 95	0.837 0.814 0.791 0.768 0.745 0.722 0.699 0.676 0.653 0.630 0.607 0.584 0.561 0.538 0.515 0.492 0.469 0.446		N O T  P E R T I N E N T

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
34	0.339	-35	161.500	-35	1.55800	40	0.197
36	0.330	-30	178.000	-30	1.69800	50	0.198
38	0.321	-25	195.799	-25	1.84700	60	0.199
40	0.312	-20	215.000	-20	2.00400	70	0.199
42	0.303	-15	235.500	-15	2.17100	80	0.200
44	0.294	-10	257.399	-10	2.34700	90	0.200
46	0.285	-5	280.899	-5	2.53200	100	0.201
48	0.276	0	305.899	0	2.72800	110	0.202
50	0.267	5	332.500	5	2.93300	120	0.202
52	0.258	10	360.799	10	3.14900	130	0.203
54	0.249	15	390.799	15	3.37500	140	0.203
56	0.240	20	422.599	20	3.61100	150	0.204
58	0.231	25	456.199	25	3.85900	160	0.204
60	0.222	30	491.799	30	4.11700	170	0.205
62	0.213	35	529.299	35	4.38600	180	0.206
64	0.204	40	568.899	40	4.66700	190	0.206
66	0.195	45	610.599	45	4.95900	200	0.207
68	0.186	50	654.299	50	5.26200		
70	0.177	55	700.299	55	5.57700		
72	0.168	60	748.500	60	5.90400		
74	0.159	65	799.099	65	6.24300		
76	0.150	70	852.000	70	6.59300		
78	0.141	75	907.299	75	6.95600		
80	0.132						
82	0.123						
84	0.114						