The MSDS format adheres to the standards and regulatory requirements of the United States and may not meet regulatory requirements in other countries.

CARBON DIOXIDE
6077CR Revised 29-AUG-1993

CHEMICAL PRODUCT/COMPANY IDENTIFICATION

Material Identification

Corporate MSDS Number	: DU000324
CAS Number	: 124-38-9
Formula	: CO2
Molecular Weight	: 44.01
CAS Name	: CARBONIC ANHYDRIDE

Tradenames and Synonyms

CARBONIC ACID ANHYDRIDE
CARBONIC ACID GAS
CARBONIC ANHYDRIDE
CARBON OXIDE (CO2)
CARBON DIOXIDE (GAS)
CC0653

Company Identification

MANUFACTURER/DISTRIBUTOR
DuPont Chemical Solutions Enterprise
1007 Market Street
Wilmington, DE 19898

PHONE NUMBERS

Product Information	: 1-800-441-7515 (outside the U.S. 302-774-1000)
Transport Emergency	: CHEMTREC 1-800-424-9300(outside U.S. 703-527-3887)
Medical Emergency	: 1-800-441-3637 (outside the U.S. 302-774-1000)

COMPOSITION/INFORMATION ON INGREDIENTS

Components

Material	CAS Number	%
CARBON DIOXIDE	124-38-9	99
TRACE CONTAMINANTS:		
CARBON MONOXIDE	630-08-0	
NITROGEN	7727-37-9	
METHANE	74-82-8	
HYDROGEN	1333-74-0	
METHANOL	67-56-1	

HAZARDS IDENTIFICATION

Potential Health Effects

Frostbite may occur on skin contact with solid or liquid carbon dioxide. As the concentration of carbon dioxide increases from 2%, effects of overexposure become more evident. Nausea, headache and weakness are initially observed, but as the concentration increases to about 20-30%, unconsciousness, convulsions and death may occur. Carbon dioxide is heavier than air and can be trapped in tanks or low places posing hazards of asphyxiation.

HUMAN HEALTH EFFECTS:

Skin contact may cause frostbite upon contact with solid or liquid. Inhalation may cause nonspecific discomfort, such as nausea, headache, or weakness at concentrations of 2% carbon dioxide during mild exertion; carbon dioxide is weakly narcotic at 3% with decreased hearing acuity, increased blood pressure, and respiration. Higher concentrations (7-10%) may produce dizziness, sweating, restlessness, headache, confusion, incoordination, and loss of consciousness. Exposure to 1.5% continuously for 42 days did not show measurable effects in physiological or psychomotor performance. Changes in EKG have been noted for exposures at or above 6% for 6-8 minutes, but exercise during inhalation of 2.8% did not result in cardiac changes. Exposures to concentrations of 11-13% produce unconsciousness after 8-23 minutes. Exposures to concentrations of 20-30% produce unconsciousness, convulsions and death in less than one minute. Most serious accidents involving carbon dioxide resulted from asphyxiation due to oxygen deficiency.

Carbon dioxide is present in the atmosphere at approximately 300 ppm. It is a normal body constiuent and respiratory stimulant.

Carcinogenicity Information

None of the components present in this material at concentrations equal to or greater than 0.1% are listed by IARC, NTP, OSHA or ACGIH as a carcinogen.

FIRST AID MEASURES

First Aid

INHALATION
If large amounts are inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

(FIRST AID MEASURES - Continued)

SKIN CONTACT
Flush area with lukewarm water. Do not use hot water. If frostbite has occurred, call a physician.

EYE CONTACT
In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Call a physician.

INGESTION
Ingestion is not considered a potential route of exposure.

FIRE FIGHTING MEASURES

Flammable Properties

Nonflammable inert gas.

Fire and Explosion Hazards:

Carbon dioxide is used as a fire extinguisher. However, it may support combustion of some reactive metals such as magnesium or sodium.

It is not effective for use on fires involving chemicals that have their own oxygen supply (i.e., cellulose nitrate); or on fires involving reactive metals (such as, potassium, sodium, magnesium, aluminum, titanium, and zirconium), or their hydrides as these materials can decompose carbon dioxide.

Extinguishing Media

Use media appropriate for surrounding material.

Fire Fighting Instructions

Wear self-contained breathing apparatus. Wear full protective equipment.

Keep personnel removed and upwind of fire.

ACCIDENTAL RELEASE MEASURES

Safeguards (Personnel)

NOTE: Review FIRE FIGHTING MEASURES and HANDLING (PERSONNEL) sections before proceeding with clean-up. Use appropriate PERSONAL PROTECTIVE EQUIPMENT during clean-up.

Evacuate personnel, thoroughly ventilate area, use self-contained breathing apparatus.

HANDLING AND STORAGE

Handling (Personnel)

Avoid breathing vapors or mist.

Avoid contact of liquid or solid with eyes, skin, or clothing.

Handling (Physical Aspects)

Do NOT puncture.

Storage

Keep container in a cool place. Store below 54 C (129 F). Store in a well ventilated place. Store in a cool place.

EXPOSURE CONTROLS/PERSONAL PROTECTION

Engineering Controls

Use sufficient ventilation to keep employee exposure below recommended exposure limits.

Personal Protective Equipment

EYE/FACE PROTECTION

Wear safety glasses. Wear coverall chemical splash goggles and face shield when possibility exists for eye and face contact due to splashing or spraying material.

RESPIRATORS

Use a positive pressure air-supplied respirator if concentrations may exceed exposure limits. Air-purifying respirators are inadequate for this material.

PROTECTIVE CLOTHING

Wear thermally protective clothing, such as gloves, apron, boots, or whole bodysuit made as appropriate to prevent frostbite when handling liquid carbon dioxide.

Exposure Guidelines

Exposure Limits

CARBON DIOXIDE

PEL (OSHA)	:	5000 ppm, 9000 mg/m3, 8 Hr. TWA
TLV (ACGIH)	:	5,000 ppm, 9,000 mg/m3, 8 Hr. TWA STEL 30,000 ppm, 54,000 mg/m3
AEL * (DuPont)	:	None Established

* AEL is DuPont's Acceptable Exposure Limit. Where governmentally imposed occupational exposure limits which are lower than the AEL are in effect, such limits shall take precedence.

PHYSICAL AND CHEMICAL PROPERTIES

Physical Data

Boiling Point	:	-79 C (-110 F) @ 760 mm Hg Sublimes
Vapor Pressure	:	844-856 mm Hg @ 21 C (70 F)
Vapor Density	:	1.65 (Air = 1.0) at 21 deg C (70 deg F) at 760 mm Hg
Freezing Point	:	-56 C (-69 F) at 75.1 psia
% Volatiles	:	100 WT% @ 0 C (32 F)
Solubility in Water	:	88 WT% @ 20 C (68 F) at 760 mm Hg
Odor	:	Odorless
Form	:	Gas, liquid
Color	:	Colorless
Specific Gravity	:	1.53 @ 21C (70F)
Density	:	97.5 lb/ft3 (1,562 kg/m3)

Solvent
Solubility : Soluble in alcohol, acetone, hydrocarbons, and most organic liquids.

Physical Hazards

Carbon dioxide is heavier than air and can be trapped in tanks or low places posing hazards of asphyxiation.

Dry carbon dioxide gas can be handled with most structural materials. Moist carbon dioxide gas is corrosive by its formation of carbonic acid. For these applications, 316, 309, and 310 stainless steels may be used as well as Hastelloy A, B, & C and Monel. Ferrous nickel alloys are slightly corroded.

STABILITY AND REACTIVITY

Chemical Stability

Stable at normal temperatures and storage conditions.

(STABILITY AND REACTIVITY - Continued)

Incompatibility with Other Materials

Incompatible with alkali metals (sodium, potassium, and lithium). These metals may react with carbon dioxide under severe conditions.

Decomposition

Decomposition will not occur.

Hazardous gases/vapors produced are carbon monoxide and oxygen when heated above 1,700 deg C (3,092 deg F).

Polymerization

Polymerization will not occur.

Other Hazards

Carbon dioxide causes violent polymerization of acrylaldehyde or ethyleneimine. This weakly acidic material will react with alkaline materials to form carbonates and bicarbonates.

An explosion can occur when carbon dioxide contacts mixtures of sodium peroxide in the presence of metals; ethyleneimine (explosive polymerization).

Also incompatible with: acrylaldehyde, exothermic polymerization; barium peroxide, incandescent reaction; cesium oxide, ignition; diethyl magnesium, ignition; hydrazine, decomposition; metal acetylides, ignition or incandescence; metal hydrides, reduction reaction; potassium, potassium-sodium alloy, sodium are impact-sensitive.

TOXICOLOGICAL INFORMATION

Animal Data

A five-hour exposure by inhalation to 30% carbon dioxide with adequate oxygen caused no deaths in rats.

Effects in animals of single doses by inhalation (approximately 10%) include increased respiration rate, increased heart rate and mild narcotic effects. If exposed to concentrations above 30%, both respiration and heart rate are decreased; reversible pulmonary edema has been noted in some animals. Concentrations above 40% may cause unconsciousness and death. Effects in animals from repeated exposures include increased incidence of kidney calcification.

(TOXICOLOGICAL INFORMATION - Continued)

Tests in some animals at 6% and 13% continuous exposures to carbon dioxide indicate that the compound may have developmental toxicity. Exposures to concentrations of approximately 35% carbon dioxide (adequate oxygen) have produced testicular effects.

ECOLOGICAL INFORMATION

Ecotoxicological Information

Aquatic Toxicity

Lethal limits, trout and tench: 100-200 mg/L

DISPOSAL CONSIDERATIONS

Waste Disposal

Treatment, storage, transportation and disposal must be in accordance with applicable Federal, State, and local regulations.

TRANSPORTATION INFORMATION

Shipping Information

DOT/IMO
Proper Shipping Name : CARBON DIOXIDE
Hazard Class : 2.2
UN No. : 1013
DOT/IMO Label : NONFLAMMABLE GAS

Shipping Containers

Pipeline

REGULATORY INFORMATION

U.S. Federal Regulations

TSCA Inventory Status : Reported/Included.

TITLE III HAZARD CLASSIFICATIONS SECTIONS 311, 312

Acute : Yes
Chronic : No
Fire : No
Reactivity : No
Pressure : Yes

(REGULATORY INFORMATION - Continued)

LISTS:

SARA Extremely Hazardous Substance	-No
CERCLA Hazardous Material	-No
SARA Toxic Chemical	-No

OTHER INFORMATION

NFPA, NPCA-HMIS

NPCA-HMIS Rating

Health	: 1
Flammability	: 0
Reactivity	: 0

Personal Protection rating to be supplied by user depending on use conditions.

The data in this Material Safety Data Sheet relates only to the specific material designated herein and does not relate to use in combination with any other material or in any process.

Responsible for MSDS	: MSDS Coordinator
>	: DuPont Chemical Solutions Enterprise
Address	: Wilmington, DE 19898
Telephone	: (800) 441-7515

This information is based upon technical information believed to be reliable. It is subject to revision as additional knowledge and experience is gained.

End of MSDS