

# SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME (GHS Product Identifier): Carbon Dioxide

(Other means of Identification): CO2, Carbonic Acid Gas, Carbon Oxide, Carbonic Anhydride

PRODUCT INTENDED USE AND RESTRICTION: Material Capture or Commercial Application

## NAME, ADDRESS & TELEPHONE NUMBER OF THE RESPONSIBLE PARTY:

Company Green Plains Trade Group LLC 1811 Aksarben Drive, Omaha, NE 68106 Phone: 402-884-8700 Email: EHSS@gpreinc.com

CHEMTREC PHONE (24HR Emergency Telephone): 1-800-424-9300 (Within U.S.A) INTERNATIONAL CHEMTREC CALL: 1-703-527-3887 OTHER CALLS: 1-402-884-8700 (M-F, 8 AM-5 PM, Central time (U.S.A & Canada); within U.S.A)

FAX PHONE: 1-402-884-8776 (M-F, 8 AM-5 PM, Central time (U.S.A & Canada); within U.S.A)

SECTION 1 NOTES: Carbon Dioxide is a by-product from the fermentation of ethanol

## **SECTION 2: HAZARDS IDENTIFICATION**

GHS LABELING AND CLASSIFICATION: This product meets the definition of the following hazard classes as defined by the Globally Harmonized System of Classification and Labelling of Chemicals (GHS).

#### **GHS CLASSIFICATION ACCORDING TO ANNEX II:**

HEALTH	ENVIRONM	IENTAL	PHYSICAL	
Acute toxicity (inhalation)-Category 5	Not Classifi	ed	Gas under pressure-Category 5-	
			Refrigerated liquefied gas	
SIGNAL WORD:		WARNING		
SYMBOL:		$\widehat{}$		
HAZARD STATEMENT:		H333: May be harmful if inhaled		
		H281: Contains refrigerated gas; may cause cryogenic burns or injury		
	PREVENTIVE:	P103: Read label before use		
	P282: Wear cold insulating gloves/face shield		s/face shield/eye protection	
PRECAUTIONARY STATEMENTS:	RESPONSE:	P304 + P312-IF INHALED: Call a POISON CENTER/doctor//if you feel unwell		
	STORAGE:	P410 + P403:Protect from sunlig	ht. Store in a well-ventilated place	
	DISPOSAL:	Not applicable		

Any Regional Considerations: N/A

#### SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

CHEMICAL NAME: Carbon Dioxide COMMON NAME: Carbon Dioxide **CHEMICAL FAMILY: Gas** CHEMICAL FORMULA: CO2 SYNONYMS: Carbonic anhydride; dry ice; carbonica

**INGREDIENT:** Carbon Dioxide

NAME	CAS#	EC#	ICSC#	<u>% WT</u>	<u>% VOL</u>
Carbon Dioxide	124-38-9	204-696-9	0021	N/A	99.0%-100.0%

CARCINOGENICITY				
OSHA: NO DATA	ACGIH: NO DATA	NTP: NO DATA	IARC: NO DATA	
OTHER: None				

IMPURITIES/STABILIZING ADDITIVES IDENTIFICATION: May contain traces of hydrogen sulfide and sulfur dioxide.

## SECTION 4: FIRST AID MEASURES

Carbon Dioxide

Green Plains

Contaminated individuals of chemical exposure must be taken for medical attention if any adverse effect occurs. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to health professional with contaminated individual.

- **EMERGENCY OVERVIEW:** Carbon Dioxide gas is colorless. At low concentrations, the gas is odorless. At higher concentrations it has a sharp, acidic odor. It will act as an asphyxiant and an irritant.
- ROUTES OF ENTRY/FIRST AID: Skin contact, eye contact, inhalation, and ingestion EYES CONTACT: Flush eyes with fresh water for minimum 15 minutes; get medical attention if necessary

#### SKIN CONTACT: N/A

INGESTION: N/A

INHALATION: Remove victim to fresh air; supply oxygen if necessary; seed medical attention

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE: Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals

#### NOTES TO PHYSICIANS OR FIRST AID PROVIDERS: Treat symptomatically

# SECTION 5: FIRE-FIGHTING MEASURES

- **EXTINGUISHING MEDIA:** Use appropriate media for surrounding fire. Move containers from fire area if you can do it without risk. Damaged cylinders should be handled only by specialists.
- PROTECTIVE EQUIPMENT AND PRECAUTIONS FOR FIRE FIGHTERS: Use self-contained breathing apparatus; usual protective firefighting gear; cool fire-exposed containers with water spray; remove containers from fire area if possible without risk; evacuate personnel upwind, if necessary

#### UNUSUAL FIRE AND EXPLOSION HAZARDS:

(Define specific hazards arising from the chemical e.g., nature of any hazardous combustion products)

Closed containers may rupture or explode due to pressure buildup when exposed to extreme heat. Carbon dioxide 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 decompose carbon dioxide.

HAZARDOUS DECOMPOSITION PRODUCTS: The substance decomposes on heating above 2000 deg C producing toxic carbon monoxide.

FLAMMABLE LIMITS IN AIR (% by volume): UPPER: Not flammable

LOWER: Not flammable

FLASH POINT: Not flammable

METHOD USED: N/A

AUTOIGNITION TEMPERATURE: Not flammable

## NFPA HAZARD CLASSIFICATION:



#### HMIS HAZARD CLASSIFICATION (0-4 scale):

Carbon dioxide	
HEALTH	1
FLAMMABILITY	0
PHYSICAL HAZARD	0
PERSONAL PROTECTION	В
Safety glasses; gloves	

## SECTION 6: ACCIDENTAL RELEASE MEASURES

- PERSONAL PRECAUTIONS, PROTECTIVE EQUIPMENT AND EMERGENCY PROCEDURES: Evacuate all non-essential personnel. Stop leak without risk. Wear gloves and goggles. Use a self-contained breathing apparatus. Ventilate area. Monitor the surrounding area for Carbon Dioxide and Oxygen levels. Carbon Dioxide must be below the TLV/PEL level shown in Section 2 and Oxygen must be at least 19.5% before personnel may be allowed into the area without self-contained breathing apparatus. A portion of released high pressure gas may form dry ice. Clear the area and allow the solid to sublime/ evaporate and dissipate. If the area must be entered by emergency personnel, self-contained breathing apparatus, Kevlar gloves, and appropriate foot and leg protection must be worn. Solid pieces of dry ice may be picked up with tongs and gloves, placed into a thermally insulated and vented container and moved to a safe disposal location.
- **ENVIRONMENTAL PRECAUTIONS:** Prevent waste from contaminating the surrounding environment. Keep personnel away. Discard any product, residue, disposable container, or liner in an environmentally acceptable manner, in full compliance with federal, state, and local regulations. If necessary, call your local supplier for assistance.
- METHODS AND MATERIALS FOR CONTAINMENT AND CLEANING UP: Ventilate area of leak to disperse gas; stop flow of gas. If source of leak is cylinder & leak cannot be stopped in place, remove to safe place in open air, & repair leak or allow cylinder to empty. Water spray may be used to convert any form of carbon dioxide to carbonic acid which may then be neutralized with alkali.

#### SECTION 7: HANDLING AND STORAGE

- **PRECAUTION FOR SAFE HANDLING:** When handling provide adequate ventilation. CO2 is heavier than air and will accumulate in low points, use forced ventilation if needed.
- CONDITIONS FOR SAFE STORAGE (any incompatibilities): Store in accordance with all current regulations and standards. Protect from physical damage. Store in a well-ventilated area. Subject to storage regulation: U.S. OSHA 29 CFR 1910.101. Keep separated from incompatible substances. Dry carbon dioxide can be handled in most common structural materials. Moist carbon dioxide is generally corrosive by its formation of carbonic acid. For applications with moist Carbon Dioxide, 316, 309 and 310 stainless steels may be used as well as Hastelloy ® A, B, & C, and Monel ®. Ferrous Nickel alloys are slightly susceptible to corrosion. At normal temperatures carbon dioxide is compatible with most plastics and elastomers.

## SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

## EXPOSURE LIMITS/GUIDELINES:

INGREDIENTS	ACGIH	NIOSH	OSHA-FINAL PELs
Carbon Dioxide	ACGIH TLV-TWA: 5000 ppm;	N/A	OSHA PEL-TWA: 5000 ppm,
	ACGIH TLV STEL: 30,000 ppm		9000 mg/m3; OSHA PEL STEL:
			30,000 ppm, 54,000 mg/m3

#### **ENGINEERING CONTROLS:**

**VENTILATION :** Use local exhaust to prevent accumulation of high concentrations so as to reduce the oxygen level in the air to less than 19.5% and the carbon dioxide concentration below the exposure limit

## PERSONAL PROTECTION EQUIPMENT (PPE):

**EYE PROTECTION:** Safety goggles or glasses as appropriate for the job

**SKIN PROTECTION:**Protective gloves of any material appropriate for the job

**RESPIRATORY PROTECTION**: Positive pressure air line with full-face mask and escape bottle or self-contained breathing apparatus should be available for emergency use

## OTHER PROTECTIVE CLOTHING OR EQUIPMENT: Safety shoes

# SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

**APPEARANCE:** Invisible gas/vapor

## PHYSICAL STATE:Gas



**COLOR:**Colorless

**ODOR:** Pungent odor, especially at increased concentrations

# pH AS SUPPLIED: Not available

pH (Other): The pH of saturated CO<sub>2</sub> solutions varies from 3.7 at 101 kPa (1 atm) to 3.2 at 2370 kPa (23.4 atm)

### FREEZING POINT:

F: -69.8 °F **C:** -56.6 °C

**BOILING POINT:**CO<sub>2</sub> sublimes

F: -109.3 C: -78.5

**MELTING POINT:** 

F:-169.84 °F C: -56.58°C (triple point)

FLASH POINT: Not flammable

**F**: C:

EVAPORATION RATE (BASIS=1): Not available

FLAMMABILITY (by %volume): UPPER FLAMMABILITY LIMIT:Not flammable LOWER FLAMMABILITY LIMIT:Not flammable

VAPOR PRESSURE (mmHg): 4.83x10+4 mm Hg

**F:** 77.0°F C: 25.0°C

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VAPOR DENSITY (AIR = 1): 1.53

F: 70 °F C: 21 °C

SOLUBILITY IN WATER: (ml CO<sub>2</sub>/100 ml H<sub>2</sub>O at 760 mm Hg): 171 at 0 deg C; 88 at 20 deg C; 36 at 60 deg C; 1.501 g/L at 25 deg C

PARTITION COEFFICIENT n-octanol/water: 0.83 AUTO-IGNITION TEMPERATURE: Not flammable F: C: **DECOMPOSITION TEMPERATURE: F:** >3632°F **C:** >2000°C SPECIFIC GRAVITY (H2O = 1): 1.56 @ F: -110.2 °F **C:** -79.0°C PERCENT SOLIDS BY WEIGHT: Not available PERCENT VOLATILE: N/A BY WT/BY VOL @ F: C: VOLATILE ORGANIC COMPOUNDS (VOC): VOCs may be present in trace amounts WITH WATER: LBS/GAL WITHOUT WATER: LBS/GAL MOLECULAR WEIGHT: 44 (CO<sub>2</sub>) VISCOSITY: 14.9 uPa-sec



Carbon Dioxide @

## SECTION 10: STABILITY AND REACTIVITY

**REACTIVITY:** Dusts of magnesium, lithium, potassium, sodium, zirconium, titanium, and some magnesium-aluminum alloys, and heated aluminum, chromium, and magnesium when suspended in carbon dioxide are ignitable and explosive. This is especially true in the presence of strong oxidizers, such as peroxides. The presence of carbon dioxide in solutions of aluminum hydride in ether can cause violent decomposition on warming the residue. Dangers arising from the use of carbon dioxide in the fire prevention and extinguishing systems of confined volumes of air and flammable vapors are examined. The hazard associated with its use centers around the fact that large electrostatic discharges may be created that initiate explosion. Contact of very cold liquid/solid carbon dioxide with water may result in vigorous or violent boiling of the product and extremely rapid vaporization due to the large temperature differences involved. If the water is hot, there is the possibility that a liquid "superheat" explosion may occur. Pressures may build to dangerous levels if liquid gas contacts water in a closed container. Forms weak carbonic acid in nonhazardous reaction with water.

## STABILITY:Stable

CONDITIONS TO AVOID (STABILITY): Avoid extremes of temperature when gas is stored in pressurized cylinder or container.

POSSIBILITY OF HAZARDOUS REACTIONS: Containers may explode when heated

- **INCOMPATIBILITY MATERIAL:** Alkali metals, chromium, metal acetylides, alkaline earth metals, titanium (above 550 degrees C), and uranium (above 750 degrees C)
- HAZARDOUS DECOMPOSITION PRODUCTS: An electrical discharge can cause Carbon Dioxide to decompose into carbon monoxide and oxygen. Carbon Dioxide will combine with water vapor or liquid to form carbonic acid

## SECTION 11: TOXICOLOGICAL INFORMATION

**TOXICOLOGICAL INFORMATION:** Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals. Exposure of female rats to 60,000 ppm carbon dioxide for 24 hours has produced toxic effects to the embryo and fetus in pregnant rats. Toxic effects to the reproductive system have been observed in other mammalian species at similar concentrations. Carbon dioxide is the most powerful cerebral vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death. Chronic, harmful effects are not known from repeated inhalation of low (3 to 5 molar %) concentrations.

#### **ROUTES OF EXPOSURE:** Inhalation or skin contact

SYMPTOMS RELATED TO THE PHYSICAL, CHEMICAL AND TOXICOLOGICAL CHARACTERISTICS: CONTACT WITH EYES: Vapor may cause stinging sensation

CONTACT WITH SKIN: No adverse effects anticipated

**INHALATION:** Carbon dioxide is the most powerful cerebral vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death. Asphyxiation is likely to occur before the effects of carbon dioxide overexposure. Chronic, harmful effects are not known from repeated inhalation of low concentrations. Low concentrations of carbon dioxide cause increased respiration and headache. Effects of oxygen deficiency resulting from simple asphyxiants may include: rapid breathing, diminished mental alertness, impaired muscular coordination, faulty judgment, depression of all sensations, emotional instability, and fatigue. As asphyxiation progresses, nausea, vomiting, prostration, and loss of consciousness may result, eventually leading to convulsions, coma, and death. Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals.

**INGESTION:** No adverse effects anticipated

#### DELAYED AND IMMEDIATE EFFECTS AND ALSO CHRONIC EFFECTS FROM SHORT- AND LONG-TERM EXPOSURE:

ACUTE HEALTH HAZARDS: Oxygen deficiency resulting in asphyxiation. Carbon dioxide is the most powerful cerebral vasodilator known. Inhaling large concentrations causes rapid circulatory insufficiency leading to coma and death.

**CHRONIC HEALTH HAZARDS:** Damage to retinal ganglion cells and nervous system may occur due to the presence of carbon dioxide. Oxygen deficiency during pregnancy has produced developmental abnormalities in humans and experimental animals. Chronic, harmful effects are not known from repeated inhalation of low (3 to 5 molar %) concentrations.

# NUMERICAL MEASURES OF TOXICITY:

LD50/LC50: No data available

**IRRITATION DATA:** No data available

CARCINOGENICITY: No data available

**EPIDEMILOGY:** No data available

TERATOGENICITY: No data available

**REPRODUCTIVE EFFECTS:** Exposure of female rats to 60,000 ppm carbon dioxide for 24 hours has produced toxic effects to the embryo and fetus in pregnant rats. Toxic effects to the reproductive system have been observed in other mammalian species at similar concentrations.

**NEUROTOXICITY:** No data available

**MUTAGENICITY:** No data available

**OTHER:** No data available

## SECTION 12: ECOLOGICAL INFORMATION

## ECOTOXICITY (AQUATIC AND TERRESTRIAL, WHERE AVAILABLE): None

- **PERSISTENCE AND DEGRADABILITY:** Carbon dioxide evolution is one of the major end points used in biodegradability tests. Ready biodegradability describes the conversion of test substances to carbon dioxide; thus recognizing that usually there will not be any further degradation.
- **BIOACCUMULATIVE POTENTIAL:** Because CO<sub>2</sub> is a naturally occurring substance that all living organisms are exposed to, and which plays a vital role in the normal maintenance of life, bioaccumulation is not anticipated.

MOBILITY IN SOIL: Due to its gaseous nature, CO<sub>2</sub> will attain equilibrium with air spaces in soil through passive diffusion

OTHER ADVERSE EFFECTS: Carbon dioxide is asphyxiate to human being

## SECTION 13: DISPOSAL CONSIDERATIONS

DISPOSAL METHOD: Flush area with water to reduce vapors or divert vapor cloud in case of spill or accidental release. Gas should dissipate in air.

#### RCRA HAZARD CLASS: Not listed

DESCRIPTION OF WASTE RESIDUES AND INFORMATION ON THEIR SAFE HANDLING AND METHODS OF DISPOSAL, INCLUDING ANY CONTAMINATED PACKAGING: Waste should be disposed of in accordance to local, state and federal regulations.

## SECTION 14: TRANSPORT INFORMATION

**U.N. GHS TRANSPORT REQUIREMENT** 

UN NUMBER: 1013 (Carbon Dioxide gas); 1845 (Carbon dioxide, solid); 2187 (Carbon dioxide, refrigerated liquid) PROPER SHIPPING NAME: Carbon Dioxide TRANSPORT HAZARD CLASS:2 PACKING GROUP: None LABEL STATEMENT: Nonflammable gas MARINE POLLUTANT: No

SPECIAL PRECAUTIONS FOR USER: N/A

## **SECTION 15: REGULATORY INFORMATION**

#### U.S. FEDERAL REGULATIONS

TOXIC SUBSTANCE CONTROL ACT (TSCA): Carbon dioxide is listed on the TSCA inventory

OCCUPATIONAL, SAFETY AND HEALTH ADMINISTRATION (OSHA): N/A

#### COMPREHENSIVE RESPONSE COMPENSATION, AND LIABILITY ACT (CERCLA): N/A

CLEAN WATER ACT (CWA): N/A

## CLEAN AIR ACT (CAA): N/A

## SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT (SARA) TITLE III INFORMATION:

#### SARA SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES: None

SARA SECTION 311/312 (40 CFR 370) HAZARD CATEGORIES: Require submission of MSDSs and reporting of chemical inventories with identification of EPA hazard categories. The hazard categories for this product are IMMEDIATE and PRESSURE.

#### SARA 313 REPORTABLE INGREDIENTS: None

STATE REGULATIONS: Carbon dioxide gas appears on or more of the following state hazardous substances list: California, Maine, Minnesota, New Jersey, Pennsylvania, and Rhode Island. Not regulated under California Proposition 65.

INTERNATIONAL REGULATIONS: This material is considered as dangerous goods, per regulations of Transport Canada. Use the above U.S. DOT information in Section 14 for part of the information needed in the preparation of Canadian Shipments

# SECTION 16: OTHER INFORMATION

DISCLAIMER: The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall the company be liable for any claims, losses or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

#### **REFERENCES:**

GHS Annex II GHS SDS Instruction

#### ACRONYMS/ABBREVIATIONS:

ACGIH-American Conference of Governmental Industrial Hygienists CAA-Clean Air Act CAS-Chemical Abstracts Service CERCLA-Comprehensive Response Compensation and Liability Act CHEMTREC-It serves as a round-the-clock resource for obtaining immediate response information for incidents involving hazardous material and dangerous goods. CWA-Clean Water Act **EC-European Commission** GHS-Globally Harmonized System of Classification and Labeling of Chemicals IARC-International Agency for the Research on Cancer ICSC-International Chemical Safety Cards LC50-The concentration of a chemical in air or of a chemical in water which causes the death of 50% of a group of test animals. LD50-The amount of a chemical, given all at once, which causes the death of 50% of a group of test animals. NIOSH-The National Institute for Occupational Safety and Health NTP-National Toxicology Program OSHA-Occupational Safety and Health Administration RCRA-Resource Conservation and Recovery Act **RQ-Reportable Quantity** SARA-Superfund Amendments and Reauthorization Act STOST-SE-Specific Target Organ Toxicity Single Exposure **TPQ-Threshold Planning Quantity** TSCA-Toxic Substance Control Act **U.N.-United Nation** UNCED-United Nations Conference on Environment and Development VOL-Volume WT-Weight