



# Carbon Dioxide

## Product Stewardship Summary

Carbon dioxide is used by plants during photosynthesis and is produced by living creatures during respiration. Industrial processes, such as burning fossil fuels, generate carbon dioxide as a by-product. Carbon dioxide has many commercial uses in industries from food processing to manufacturing to firefighting.

### Chemical Identity

- *Chemical Formula:*  $CO_2$
- *Other names:* carbonic anhydride, carbonic acid gas

### Uses and Benefits

Carbon dioxide is used in the foods industry for freezing food, for keeping food cold during transport (dry ice), and for adding carbonation to beverages.

In the electronics industry, carbon dioxide is used in manufacturing applications, including semiconductor device manufacturing, surface cleaning, and circuit board assembly.

The chemical industry uses carbon dioxide to produce fertilizers, plastics, and polymers. It is also used to purge, pressurize and cool equipment. As a supercritical fluid, carbon dioxide can be used to replace organic solvents.

Welders use carbon dioxide to help prevent impurities, like rust, from forming at welds.

In water treatment plants, carbon dioxide is safer to handle than mineral acids for pH control.

Carbon dioxide can also be found in many fire extinguishers and can be used on fuel or electrical fires. Carbon dioxide prevents oxygen from fueling the fire, and it does not leave any residue.

### Physical and Chemical Properties

Carbon dioxide is a colorless gas that is heavier than air. Carbon dioxide does not burn. At low concentrations, carbon dioxide gas has no odor. At high concentrations, it has a sharp, acidic smell. At normal temperatures, carbon dioxide

does not react with many materials. Carbon dioxide dissolves in water to form carbonic acid. It can be easily and safely liquefied, solidified, handled, and stored.

## Health Effects

At low carbon dioxide concentrations, our breathing rate increases, capillaries dilate and the skin becomes flushed. With more severe exposure, the rapid breathing becomes labored, causing restlessness, faintness, headache, and dulling of consciousness. High concentrations of carbon dioxide can cause asphyxiation quickly, without warning, regardless of the

oxygen concentration. No one should enter an area with greater than 3 percent carbon dioxide without special breathing equipment to prevent adverse effects.

Liquid carbon dioxide is so cold that skin contact can result in severe frostbite, skin burns and other tissue damage.

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## Environmental Effects

Carbon dioxide plays a vital role in the earth's environment and in plant and animal metabolism. Oxygen from the air we breathe reacts with sugars in our bodies to produce energy,

water and carbon dioxide. We exhale about 5 percent carbon dioxide. Plants use the carbon dioxide in the air, along with water and energy from the sun, to produce sugars.

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## Exposure Potential and Risk Management Measures

### Industrial Use

We can supply carbon dioxide in cylinders as a high-pressure gas or a refrigerated liquid. Industry guidelines cover the storage and handling of compressed gas cylinders. Workers should use sturdy work gloves, safety glasses and safety shoes when handling compressed gas cylinders. Liquid carbon dioxide is extremely cold. Workers must protect their skin from contact with the liquid or vapors. It is also important to wear a full face-shield and clean, loose-fitting, thermal-insulated gloves to protect the eyes, face and hands.

To help prevent adverse effects, it is important to have good ventilation when working with carbon dioxide. According to the U.S. Occupational Safety and Health Administration (OSHA), carbon dioxide in workplace air should not exceed 5,000 parts per million or 0.5 per-

cent averaged over an eight-hour workshift. Areas in which carbon dioxide gas may collect should be monitored. If the carbon dioxide level exceeds 3 percent, personnel—including rescue workers—should not enter the area without special breathing equipment, which provides an independent source of clean breathing air.

### Consumer Use

We do not sell carbon dioxide directly to consumers. Consumers may use carbon dioxide in fire extinguishers for protection from electrical fires and fires caused by oils, fuels or solvents. A frozen form of carbon dioxide, called “dry ice,” can be used to keep food cold. Heavy gloves or ice tongs should be used when handling dry ice.

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## Regulatory Information

Several regulations govern the manufacture, sale, transportation and use of carbon dioxide. These laws vary by country and geographic region. You can find general regulatory information in the [Material Safety Data Sheet](#).

## Sources for Additional Information

- [Air Products–MSDS](#)
- [Air Products CO2 Capture and Purification Technologies](#)
- [Compressed Gas Association](#)
- [Air Products Safetygrams](#)



### **Conclusion**

A wide variety of industries use carbon dioxide, a gas that also helps support plant and animal life. It can be handled safely without harming the environment when industry and company guidelines are followed.

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### **Contact Information**

#### **Emergency Response System**

- Tel 1-800-523-9374  
(Continental U.S. and Puerto Rico)
- Tel 1-610-481-7711 (other locations)
- 24 hours a day, 7 days a week
- For assistance involving Air Products and Chemicals, Inc. gases and equipment

#### **Technical Information Center**

- Tel 1-800-752-1597 (U.S.)
- Tel 1-610-481-8565 (other locations)
- Fax 1-610-481-8690
- E-mail [gasinfo@airproducts.com](mailto:gasinfo@airproducts.com)
- Monday–Friday, 8:00 a.m.–5:00 p.m. ET

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We developed this Product Stewardship Summary to give you a general overview of the chemical. This Summary is not meant to provide emergency response or medical treatment information. You can find in-depth safety and health information on the [Material Safety Data Sheet](#) for the product.

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