



Oxygen

Product Stewardship Summary

Oxygen makes up 21 percent of the air we breathe. Our bodies need oxygen to support life, so oxygen has many medical and healthcare uses. Oxygen is also used in many industries, including metal and glass manufacturing, chemicals and petroleum processing, pharmaceuticals, pulp and paper, aerospace, wastewater treatment and even fish farming.

Chemical Identity

- *Chemical formula:* O_2
- *Other names:* oxygen gas, gaseous oxygen (GOX), liquid oxygen (LOX)

Uses and Benefits

Our bloodstream absorbs oxygen from the air in our lungs to fuel the cells in our bodies. Healthcare providers use medical oxygen for patients in surgery and for those who have difficulty breathing. For home use, lightweight, portable oxygen cylinders give patients freedom to go out into the community.

Oxygen promotes combustion, so it helps manufacturers save fuel and energy and reduce the emission of greenhouse gases such as carbon dioxide, nitrogen oxide or sulfur oxide. Using oxygen-enriched air increases production efficiency in steel, rocket fuel, glass, chemical and metallurgical processing applications. Manufacturers of aluminum, copper, gold and lead use oxygen to remove metals from ore more efficiently. As a result, they can often use lower-grade ores and raw materials, which helps conserve and extend our natural resources. For metal fabrication, oxygen is often used with acetylene, propane, and other gases to cut and weld metals.

The chemical and petroleum industries combine oxygen with hydrocarbon building blocks to make products such as antifreeze, plastic and nylon.

The pulp and paper industry uses oxygen to increase paper whiteness while reducing the need for other bleaching chemicals. They also use it to reduce odors and other emissions.

Municipal and industrial wastewater plants use oxygen to make the treatment process more efficient and increase basin capacity during plant expansions or plant upsets. Municipal water plants use oxygen as feed gas to their ozone systems to remove taste, odor and color from drinking water. Oxygenated water also improves the health and size of the fish for fish farming operations so farmers around the world can supply high-quality food.

Physical and Chemical Properties

Oxygen has no color or smell. Oxygen is slightly heavier than air and slightly water soluble. Oxygen combines readily with many elements to form compounds called “oxides.” One example is iron oxide, or rust, that forms on iron in the presence of oxygen and moisture. Although oxygen itself is nonflammable, combustible materials burn more strongly in oxygen.

Even though most applications use oxygen in the gas form, it can be cooled to a pale blue liquid at extremely low temperatures (-297°F/-183°C). To put that temperature into perspective, water freezes at 32°F/0°C.

Health Effects

Oxygen is necessary to support life. The air we breathe contains 21 percent oxygen. Oxygen is mostly nontoxic. People can breathe air that contains up to 50 percent oxygen for 24 hours or more with no ill effects. Breathing more than 75 percent oxygen for more than a few hours may cause a stuffy nose, cough, sore throat or chest pain, or make it hard to breathe.

Breathing pure oxygen under pressure may cause lung damage and central nervous

system problems within a few hours. Signs and symptoms include nausea, dizziness, vomiting, tiredness, mood changes, confusion, lack of coordination, muscle twitches, burning or tingling of the fingers or toes, and loss of consciousness. Reducing the oxygen pressure can reverse the effects. Continued exposure to pressurized oxygen can lead to severe convulsions and death.

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

Environmental Effects

We can manufacture and use oxygen safely without harming the environment. Oxygen is the most abundant element on the earth’s surface and is a component of most rocks, minerals, and soils. The oxygen in the earth’s

atmosphere comes from the photosynthesis of plants. The presence of excess oxygen promotes rapid combustion and creates a fire hazard when combustible materials (such as oil and grease) are also present.

Exposure Potential and Risk Management Measures

Industrial Use

We ship oxygen as a high-pressure gas or a cold liquid. We often ship and store larger quantities of oxygen in liquid form, because it occupies much less space that way.

Depending on how much oxygen gas our customer uses, we store and ship it in high-pressure cylinders and tubes. Industry guidelines cover the storage and handling of compressed gas cylinders. Workers should use sturdy work gloves, safety glasses with side shields and safety shoes when handling compressed gas cylinders.

We store and ship liquid oxygen in three different types of containers—dewars, cryogenic liquid cylinders and cryogenic liquid tanks. These containers are similar to heavy-duty vacuum bottles used to keep your coffee hot or your water cold. Because of its low temperature, liquid oxygen should not come in contact with skin. If workers handle containers of liquid oxygen, it is important to wear a full face-shield over safety glasses to protect the eyes and face. Workers should also wear clean, loose-fitting, thermal-insulated gloves; a long-sleeved shirt and pants without cuffs; and safety shoes.

The risk of fire increases when oxygen levels in the air are higher than normal. Clothing and hair readily trap oxygen and are highly combustible. It is important to have good ventilation when working with oxygen and to periodically test the atmospheres in confined areas to ensure that oxygen levels do not increase and create an increased fire hazard. Personnel should know the risk, keep the area clear of combustible materials and post “No Smoking” signs.

Equipment used in oxygen service must be cleaned according to strict industry guidelines to avoid contamination.

Consumer Use

Oxygen for breathing purposes requires a prescription. Patients who are using supplemental oxygen should follow their healthcare provider’s guidelines. Visits to “oxygen bars” are not recommended since appropriate safety and health precautions may not be taken. In addition, odorants and flavored oxygen could harm people with certain health problems.

Regulatory Information

Several regulations govern the manufacture, sale, transportation, and use of oxygen. 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](#)
- [Compressed Gas Association](#)
- [National Fire Protection Association](#)
- [Air Products Safetygrams](#)

Conclusion

Oxygen is used in a variety of healthcare and industrial applications. It can be handled safely when used in accordance with company and industry guidance.



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
- Monday–Friday, 8:00 a.m.–5:00 p.m. EST

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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