

# Safety Data Sheet



## 1. Identification of the Substance/Mixture and the Supplier

Supplier : National Institute of Advanced Industrial Science and Technology (AIST)  
 Address : 1-3-1 Kasumigaseki, Chiyoda, Tokyo, Japan  
 Office in charge : Reference Materials Office, Center for Quality Management of Metrology, National Metrology Institute of Japan  
 Person in charge : Certified Reference Material Staff  
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 Emergency contact : Same as above

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Revised on : -

Reference No. : 3404004

Identity of substance/mixture : Certified reference material NMIJ CRM 3404-d Oxygen  
 Recommended use of the chemical and restriction on use : This reference material can be used, in calibration of oxygen concentration in standard gases. Do not use this reference material for other purposes than testing/research.

## 2. Hazard Identification

GHS classification : Oxidizing Gas : Hazard Category 1  
 : Gas under pressure : Compressed gas

GHS-labeling element :



Signal word : Danger

Hazard and toxicity information : May cause or intensify fire; oxidizer.  
 Contains gas under pressure; may explode if heated.  
 Inhalation of concentrated oxygen gas may lead to adverse effects on human health. Gas blowout from the high-pressure gas cylinder may cause damage to eyes or loss of vision.

Precautionary statement : [Safety Precaution]  
 Keep away from clothing and other combustible materials.  
 Keep valves and fittings free from oil and grease.

[Response]

In case of fire, stop leak if safe to do so.

[Storage]

Keep out of sunlight in a well-ventilated area at a temperature below 40 °C.

Separate the product from combustible and toxic gases.

Do not place combustible materials near the storage site.

[Disposal]

For content disposal, select a well-ventilated area away from fire and combustible materials, and release the gas slowly.

Dispose of this CRM in accordance with applicable legislation and local government ordinance. Entrust disposal of this CRM to a professional waste disposal company licensed by the prefectural governor.

Entrust disposal of this reference material to a professional waste disposal company licensed by prefectural governor.

The other hazards than the above do not result in classification or are not covered by the GHS.

Other hazards information : Inhalation of high concentrations of oxygen gas for a long time adversely affects the human body.  
If gas gushes out of the high-pressure gas container and enters the eye, there is a risk of damage to the eye or loss of sight.

### 3. Composition/Information on Ingredients

Substance or mixture : Substance  
 Chemical name : Oxygen  
 Content : 99.9 %<  
 Chemical formula or structural formula : O<sub>2</sub>  
 Molecular mass : 32.00  
 Reference number in gazetted list in Japan : Act on the Evaluation of Chemical Substances and Regulation of Their Manufacture, etc. : -  
 Industrial Safety and Health Act : -  
 CAS number : 7782-44-7  
 Hazardous component : Oxygen

### 4. First-Aid Measures

Inhalation : When concentrated oxygen gas has been inhaled and the exposed person shows symptoms of poisoning, immediately remove the person to fresh air. Loosen the clothing, wrap them up in a blanket to keep warm, and provide medical attention to them.  
 Skin contact : When exposed to the ambient pressure of oxygen gas, no medical care is required.  
 Eyes contact : If eyes are exposed to blown-out oxygen gas, cool them by flushing with cold water and immediately seek medical attention.  
 Ingestion : No data  
 Most important symptoms/effects, acute and delayed : Inhalation: cough, dizziness, sore throat, blurred vision.  
 Skin: frostbite (when touching liquid)  
 Eyes: Frostbite (when touching liquid)

In very high concentrations, it irritates the respiratory tract.  
It may affect the central nervous system, lungs, and eyes.  
Contact with rapidly expanding gas may cause frostbite.

Protection of first-aiders : If oxygen gas leaks or blows out, oxygen concentration may increase in the air around the site. Ventilate the area and wear a respiratory protective device such as a respirator if needed.

## 5. Fire-Fighting Measures

Suitable extinguishing media : Use an extinguishing agent suitable for the surrounding fire. Because it is an oxidizing gas, if a fire occurs in the vicinity, the fire will be intensified and burned violently, so immediately stop supplying oxygen gas.  
If oxygen gas blows out, dry extinguishing agent or carbonic anhydride will not have any effect on the fire.

Unusable extinguishing media : Water injection

Fire-specific hazard : Even materials that do not burn in air often burn in oxygen gas. Keep surrounding objects as far from the gas as possible. Oxygen is an oxidizing agent that becomes stronger when fire is present in the immediate area. Therefore, stop supplying oxygen as soon as possible.  
To prevent the cylinder from heating, cool it with water. The inner pressure of the cylinder will increase if exposed to fire, leading to failure of the safety device and blowout of oxygen gas. If the inner pressure increases rapidly, the cylinder may burst. If possible, carry the cylinder to a safe place. If not, spray water from the windward side as far from the cylinder as possible to cool it down.

Specific fire-fighting method : When you find a fire, evacuate outsiders to safety first.

Protection of fire-fighters : Fire-fighter should wear appropriate protective equipment such as refractory gloves and fireproof clothing, and work from the windward side as far from the fire as possible.

## 6. Accidental Release Measures

Personal precaution, personal protective equipment and emergency procedure : Work clothes may catch fire. Prevent exposure to oxygen gas. To reduce the risk of fire, open windows and doors to ventilate. If a ventilation system is available, activate it immediately for ventilation.  
If a large amount of gas leaks continuously, surround the gas-leak area with ropes and monitor it to prevent people from entering. If the oxygen concentration is high, static charge from dust in air or from clothes, or a spark from illumination or other electric sources may cause fire or an explosion.

A person who enters the gas-leak area should wear a respiratory protective device, such as a respirator.  
 Measure and control the oxygen concentration in air.

- Environmental precaution : There is no environmental impact.
- Recovery and neutralization : Quickly ventilate and diffuse the leaked oxygen gas for dilution.
- Prevention of secondary disaster : Remove combustible materials such as wood materials, paper, and oil. Do not let air containing concentrated oxygen come in contact with organic matter and combustible substances.  
 Remove all ignition sources.

## 7. Handling and Storage

### Handling

- Engineering precaution/ local and general ventilation : Check joint parts, hose, pipes, and equipment to confirm that there is no leakage. To conduct a leak test easily, safely, and reliably, use a bubbling liquid, such as soapy water.  
 When leaving a work site, always close the cylinder valve. Then, release the gas inside the pressure regulator and loosen the pressure-control handle.  
 Do not use the cylinder as part of an electrical circuit. Do not cause damage by generating arc strikes, especially during arc welding. If the cylinder valve is frozen, warm it with hot water of 40 °C or less and do not heat it directly with a burner or the like.  
 Do not handle the parts in contact with oxygen gas with oily or dirty hands or gloves. In advance, confirm that no oil or grease has adhered to your hands, gloves, and clothes. If oils and fats are ignited in oxygen gas, explosive combustion occurs. ?  
 Keep equipment and ancillary an equipment for oxygen (such as tank, cylinder, valves, evaporator, and gauges) clean, and protect them from oil and grease, organic matter, dust, rust, and burrs. If any of these substances adheres to the equipment, remove it completely before using the equipment.  
 Use a pressure regulator, hose, and pressure gauge for exclusive oxygen.  
 Do not mix oxygen equipment and accessories with those for other gases.  
 Use a pressure gauge with an indication "Lubrication prohibited."  
 Use a predetermined handle to open and close the cylinder valve. Open and close the cylinder valve slowly. Otherwise, it may catch fire because of frictional heat, or the pressure regulator or pipe may catch fire because of adiabatic compression.  
 Do not use combustible gaskets for the supply system.

If the content is not what you need, do not use it and return the cylinder to the dealer.

If high-pressure gas is sprayed directly on the human body, it may cause damage, so do not touch the gas that gushes out at high pressure directly.

Do not fill the cylinder with gas.

Do not repair, repaint, remove or replace cylinder valves and safety equipment.

Do not modify, erase, or peel off the engraving, display, etc. of the cylinder.

As oxygen gas is more oxidizing than air, it may occur violently reaction and/or explosion with organic matters and/or combustibles under almost all of temperature and pressure conditions.

Precautions for safe handling : When releasing gas for the purpose of removing dust adhering to the mouth metal inside the container valve, the gas outlet valve is finely opened for a short time in the direction where there is no person.

Open valve slowly to avoid pressure shock.

When the cylinder is not used, make sure to attach a valve protection cap.

Handle the cylinder in accordance with the High Pressure Gas Safety Act.

High-pressure gas released directly toward the human body may cause injury. Do not put your hand into blowing high-pressure gas.

Do not use the container for any purpose other than the original purpose of the container, such as rollers or mold substitutes.

Do not use oxygen gas instead of compressed air or air.

Do not use this CRM when the inner pressure is 0.1 MPa or less.

Incompatible substances or mixtures : If there is a possibility that other gas has entered the container, contact the seller with details such as the container symbol number. As oxygen gas has a much higher oxidizing power than air, it should not be allowed to come into contact with alkali metals, benzoic acid (powder), carbon disulfide, fiber materials, hydrogen + catalyst, acetone, acetylene, alcohol, oil, and grease. If organic matter or combustible materials comes into contact with oxygen gas, they may react rapidly or explode at almost any temperature and pressure.

Fabric, wood, and other porous organic materials retain oxygen gas for a relatively long time. As they burn fiercely, do not place them close to an ignition source.

Even incombustible or flame-resistant substances that do not burn in air may burn in oxygen gas.

Hygiene controls : Do not eat, drink or smoke outside the designated area. After handling, wash hands, face, etc. well and gargle.

Gloves and other contaminated protective equipment must not be provided at rest areas.

Non-party persons are prohibited from entering the handling area.

Wear appropriate protective equipment so as not to inhale or touch the eyes, skin and clothing.

#### Storage

Appropriate storage condition : Separate from combustible and toxic gases.  
Do not place combustible materials near the storage site.  
Prepare fire control equipment next to the storage site.  
The oxygen concentration at the storage site is ventilated so as not to exceed 25 vol%, and the oxygen concentration is measured and managed.  
The site must be kept away from sources of heat and ignition.  
Do not store the cylinders near electric wiring and earth wires.  
Store the cylinders in a dry, and well-ventilated place.  
Protect them from corrosive atmosphere or continuous vibration.  
Keep them away from direct sunlight and maintain the temperature below 40 °C.

Safe container packaging material : Use cylinders designed and manufactured as high-pressure gas cylinders for oxygen.

※ See the Certificate for the details on appropriate storage conditions and instructions for use as a reference material.

## 8. Exposure Controls/Personal Protection

Threshold limit value : Not applicable

Permissible concentration

ACGIH TLV-TWA (2000) : Not applicable

Values recommended by Japan Society for Occupational Health (1998) : Not applicable

• OSHA PEL TWA : Not applicable

Engineering control

- Ventilation/ exhaust : Local or general ventilation device.
- Safety management/ gas detector : Gas detector and detecting tube.
- Storage precaution : When using or storing indoors, keep away from combustible materials and take measures for ventilation in order to keep oxygen concentration below 25 vol%.

Personal protective equipment

- Respiratory protection : Respirator or air-supplied respirator if needed.
- Hands : Leather gloves.
- Eyes : Safety mask and protective glass.

- Skin and body : Wear appropriate protective clothing.

## 9. Physical and Chemical Properties

Appearance, etc.	: Gas at ambient temperature and pressure
Color	: Colorless
Odor	: Odorless
Melting point	: -218.4 °C (101.3 kPa)
Boiling point	: -183.0 °C (101.3 kPa)
Flammability	: Non-flaring
Explosive range	: None
Flashing point	: No data
Auto-ignition temperature	: None
pH	: No data
Kinematic viscosity	: No data
Solubility	: 3.10 mL/100 mL H <sub>2</sub> O (Bunsen absorption coefficient in water at 20 °C converted to 100 mL water)
<i>n</i> -Octanol/water partition coefficient (log Po/w)	: No data
Vapor pressure	: No data
Relative vapor density (Air=1)	: 1.11 (25 °C, 0.1013 MPa(1 atm))
Specific gravity or bulk specific gravity	: 1.429 kg/ m <sup>3</sup> (0 °C, 0.1013 MPa (1 atm))
Particle characteristics	: No data

## 10. Stability and Reactivity

Reactivity	: Very oxidizing. May react with organic compounds, metals and flammable materials.
Stability	: Stable in normal conditions.
Possibility of hazardous reactions	: It is a powerful oxidant, reacts with combustible and reducing substances and is at risk of fire and explosion. Non-flaring, but encourages the combustion of other substances. When heated, a pressure increase with the risk of rupture occurs.
Conditions to avoid	: Heating Reaction with organic matter and other combustible materials. As oxygen concentration increases, combustion speed accelerates, ignition point decreases, flame temperature increases, and flame expands.
Incompatible material	: Alkali metals, benzoic acid (powder), carbon disulfide, fiber materials, hydrogen + catalyst, acetone, acetylene, alcohol, oil and grease, and other organic and combustible materials. Organic materials, combustible materials metals.
Hazardous decomposition products	: No data

## 11. Toxicological Information

Acute toxicity	:	Prolonged inhalation of high concentrations of oxygen may cause oxygen intoxication (irritation of the lungs, anterior thoracic discomfort, decreased lung capacity, perceptual abnormalities, convulsions, general malaise, blood abnormalities, etc.).
Skin corrosion/irritation	:	No data
Serious eye damage/ eye irritation	:	No data
Respiratory or skin sensitization	:	No data
Germ cell mutagenicity	:	No data
Carcinogenicity	:	No data
Reproductive toxicity	:	In a study in which pregnant females of hamsters and rabbits were exposed to high-pressure oxygen or high concentrations of oxygen, umbilical hernia, brain prolapse, spinal fissure, and limb defects were observed in hamsters (Teratogenic (12th, 2007) ), In rabbits, absorption, malformations, eye defects, high mortality rates, and low frequency premature babies were confirmed, but it was a test results under high pressure oxygen and could not be classified due to the lack of data on sexual function and reproductive function of parent animals. (Birth Defects (3rd, 2000) ).
Specific target organ/ systemic toxicity (single exposure)	:	Bronchial and vascular contractions were seen in 24 hours when rats were exposed to 100 % oxygen (PATY (5th, 2001)) Exposure of rabbits to 100 % concentrations of oxygen revealed a decrease in lung volume, a decrease in phospholipids (surface active substances), and pulmonary edema in 24 to 96 hours (PATY (5th, 2001)) . When rats are exposed to 95 % oxygen, the surface active substance decreases in 12 hours PATY (5th, 2001)) . Both are found in doses beyond the scope of guidance. In humans, coughing is observed within 4 hours after exposure to 95 % concentration of oxygen (PATY (5th, 2001)) . In addition, coughing is observed within 3 hours when exposed to 90 to 95 % concentration of oxygen (HSDB(2007)) . From this, it was classified into category 3 (airway irritation).
Specific target organ/ systemic toxicity (repeated exposure)	:	No data



Aspiration hazards : No data

※ This reference material is stable under normal condition, and there is no risk of noxious additive ingredient elusion. In case of handling this reference material under special conditions, such as high temperatures, however, it is recommended to take sufficient safety precautions for appropriate use.

## 12. Ecological Information

Ecotoxicity : No information  
 Persistence and degradability : No information  
 Bioaccumulative Potential : No information  
 Mobility in soil : No information  
 Influence to the ozone layer : No information

## 13. Disposal Considerations

Residual waste : When this certified reference material becomes unnecessary or the due date expires, return it to the Metrology Management Center.  
 Contaminated container and package : Return the used empty and unnecessary cylinders to the office in charge shown in "1. Identification of the Substance/Mixture and the Supplier", when it is no longer needed or exceeds its shelf life.  
 The owner of the cylinder is National Institute of Advanced Industrial Science and Technology (AIST). The User must not dispose of cylinder without the owner's consent.

## 14. Transport Information

### International regulations

UN Number : 1072  
 Material name : OXYGEN, COMPRESSED  
 UN Classification : Class 2.2, Sub Risk 5.1  
 Container grade : Not applicable  
 Marine pollutant : N/A  
 Precaution : Store in a cool and well-ventilated area  
 Close the cylinder valve firmly, and attach the valve protection cap correctly.  
 Transport this reference material carefully while keeping it away from direct sunlight and fire and preventing accidental release due to falling, overturning, etc.  
 Do not transport with food and feed.

### Japanese domestic regulations

Transport by road/rail : Comply with Fire Service Act, Poisonous and Deleterious

	Substances Control Act, High Pressure Gas Safety Act
Transport by sea	: Comply with Ship Safety Act and Act on Port Regulations
Transport by air	: Obey Civil Aeronautics Act

## 15. Regulatory Information

- ◇ High Pressure Gas Safety Act
  - Compressed gas (Act Article 2-1)
  - Manufacturing, sales, storage, movement, consumption, disposal
- ◇ Industrial Safety and Health Act
  - Manufacturing, storage, consumption
- ◇ Fire Service Act
  - Manufacturing, storage, movement
- ◇ Ship Safety Act
  - High-pressure gas (Dangerous Material Rule Articles 2 and 3: Dangerous Material Announcement Appendix 1); Movement
- ◇ Act on Port Regulations
  - Hazardous material high-pressure gas (Regulations for the Enforcement of Act on Port Regulations, Clause 12) ; Movement
- ◇ Civil Aeronautics Act
  - (Regulations for the Enforcement of Civil Aeronautics Act, Clause 194); Movement
- ◇ Road Act
  - Restrictions on vehicle traffic (Road Act Enforcement Ordinance, Clause 19-13); Movement
- ◇ Road Traffic Act
  - Movement
- ◎ **This SDS was originally prepared for the use of the reference material in Japan, and therefore Section 15 “Regulatory Information” covers only those laws and regulations which are enacted and enforced in Japan. In case of using this reference material, it is necessary to refer to and apply relevant laws and regulations of the country in which it is used.**

## 16. Other Information

### Others

The information in this document is not intended to be exhaustive and is based on currently available information and data. The measures given in this document are applicable only to normal handling conditions. When handling this reference material under special conditions etc., it is recommended to take safety measures appropriate to each specific application and context of use. This document is intended to provide information and not intended to guarantee anything in handling this reference material.