Material Safety Data Sheet
Oxygen, Liquid (LOX)

SECTION 1: Identification

1.1. Product identifier

Product name : Oxygen (refrigerated liquid)

CAS No : 7782-44-7

Formula : O_2

Synonyms : Cryogenic Liquid Oxygen / Oxygen

1.2. Recommended use and restrictions on use

Recommended uses and restrictions : Various/Special atmospheres for food/Laser applications

SECTION 2: Hazard identification

2.1. Classification of the substance or mixture

Classification (GHS-CA)

Oxidizing Gases, Category 1 H270

Gases under pressure: Refrigerated liquefied gas H281

Full text of H statements: see section 16

2.2. GHS Label elements, including precautionary statements

GHS-CA labelling

Hazard pictograms (GHS-CA) :

GHS03 GHS04

Signal word (GHS-CA) : Danger

Hazard statements (GHS-CA) : H270 - May cause or intensify fire; oxidizer
H281 - Contains refrigerated gas; may cause cryogenic burns or injury

Precautionary statements (GHS-CA) : P202 - Do not handle until all safety precautions have been read and understood
P220 - Keep away from clothing and other combustible materials
P244 - Keep valves and fittings free from oil and grease
P271 - Use only outdoors or in a well-ventilated area
P282 - Wear cold insulating gloves and either face shield or eye protection
P336+P315 - IF ON SKIN: Thaw frosted parts with lukewarm water. Do not rub affected area
P315 - Get immediate medical advice/attention
P370+P376 - In case of fire: Stop leak if safe to do so
P403 - Store in a well-ventilated place
CGA-PG05 - Use a back flow preventive device in the piping
CGA-PG06 - Close valve after each use and when empty
CGA-PG10 - Use only with equipment rated for cylinder pressure
CGA-PG20 - Use only with equipment of compatible materials of construction and rated for cylinder pressure
CGA-PG22 - Use only with equipment cleaned for oxygen service

2.3. Other hazards

Other hazards not contributing to the classification : None.

2.4. Unknown acute toxicity (GHS-CA)

No data available

SECTION 3: Composition/information on ingredients

3.1. Substances

Name	Product identifier	%	Classification (GHS-CA)
Oxygen (refrigerated liquid) (Main constituent)	(CAS No) 7782-44-7	100	Ox. Gas 1, H270 Refrigerated liquefied gas, H281

Full text of H-statements: see section 16

3.2. Mixtures

Not applicable

SECTION 4: First-aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to uncontaminated area.

First-aid measures after skin contact : In case of frostbite spray with water for at least 15 minutes. Apply a sterile dressing. Obtain medical assistance.

First-aid measures after eye contact	:	Immediately flush eyes thoroughly with water for at least 15 minutes.
First-aid measures after ingestion	:	Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects (acute and delayed)

Symptoms/effects after inhalation	:	Adverse effects not expected from this product.
Symptoms/effects after skin contact	:	Contact with the liquefied gas may cause frostbite.
Symptoms/effects after eye contact	:	Direct contact with the liquefied gas may cause severe and possibly permanent eye injury due to frostbite from rapid liquid evaporation.
Symptoms/effects after ingestion	:	Burns.
Symptoms/effects upon intravenous administration	:	Adverse effects not expected from this product
Chronic symptoms	:	Adverse effects not expected from this product.

4.3. Immediate medical attention and special treatment, if necessary

Other medical advice or treatment	:	If you feel unwell, seek medical advice.

SECTION 5: Fire-fighting measures

5.1. Suitable extinguishing media

Suitable extinguishing media	:	Water spray or fog.

5.2. Unsuitable extinguishing media

Unsuitable extinguishing media	:	Do not use water jet to extinguish.

5.3. Specific hazards arising from the hazardous product

Reactivity	:	No reactivity hazard other than the effects described in sub-sections below.

5.4. Special protective equipment and precautions for fire-fighters

Firefighting instructions	:	Exposure to fire may cause containers to rupture/explode.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures	:	Try to stop release. Evacuate area. Monitor concentration of released product. Eliminate ignition sources. Use protective clothing. Ensure adequate air ventilation. Prevent from entering sewers, basements and work pits, or any place where its accumulation can be dangerous.

Personal Precautions, Protective Equipment and Emergency Procedures	:	EVACUATE ALL PERSONNEL FROM AFFECTED AREA. Use appropriate protective equipment. If leak is on user's equipment, be certain to purge piping before attempting repairs. If leak is on a container or container valve contact the closest Gasal location.

6.2. Methods and materials for containment and cleaning up

For containment	:	Try to stop release if without risk.
Methods for cleaning up	:	Dispose of contents/container in accordance with local/regional/national/international regulations.

6.3. Reference to other sections

For further information refer to section 8: "Exposure controls/personal protection"

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Precautions for safe handling	:	Do not handle until all safety precautions have been read and understood. Use only outdoors or in a well-ventilated area.
Hygiene measures	:	Do not eat, drink or smoke when using this product.
Additional hazards when processed	:	Pressurized container: Do not pierce or burn, even after use.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures	:	Comply with applicable regulations.
Storage conditions	:	Do not expose to temperatures exceeding 52 °C/ 125 °F. Keep container closed when not in use. Protect cylinders from physical damage; do not drag, roll, slide or drop. Store in well ventilated area.
Incompatible products	:	None known.
Incompatible materials	:	Flammable materials. Combustible materials. Reducing agents.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

No additional information available

8.2. Appropriate engineering controls

Appropriate engineering controls	:	Provide adequate general and local exhaust ventilation. Systems under pressure should be regularly checked for leakages. Avoid oxygen rich (>23,5%) atmospheres. Gas detectors should be used when oxidizing gases may be released. Consider work permit system e.g. for maintenance activities.

8.3. Individual protection measures/Personal protective equipment

Personal protective equipment : Gloves. Safety glasses. Protective clothing. Safety shoes. Face shield.

Hand protection	:	Wear working gloves when handling gas containers.
Eye protection	:	Wear safety glasses with side shields. Wear goggles and a face shield when trans filling or breaking transfer connections.
Skin and body protection	:	Wear suitable protective clothing, e.g. lab coats, coveralls or flame resistant clothing.
Respiratory protection	:	None necessary during routine operations. See Sections 5 & 6.
Thermal hazard protection	:	Wear cold insulating gloves when trans filling or breaking transfer connections.
Environmental exposure controls	:	Refer to local regulations for restriction of emissions to the atmosphere. See section 13 for specific methods for waste gas treatment.
Other information	:	Consider the use of flame resistant safety clothing. Wear safety shoes while handling containers.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state	:	Liquid
Appearance	:	Liquefied compressed gas.
Molecular mass	:	31.9988 g/mol
Color	:	Bluish liquid.
Odor	:	No odor warning properties.
Odor threshold	:	No data available
pH	:	No data available
pH solution	:	No data available
Relative evaporation rate (butyl acetate=1)	:	No data available

Relative evaporation rate (ether=1)	:	Not applicable for gases and gas mixtures.
Melting point	:	-219 °C
Freezing point	:	-219 °C
Boiling point	:	-183 °C
Flash point	:	Not applicable for gases and gas mixtures.
Critical temperature	:	-118 °C
Auto-ignition temperature	:	Not applicable.
Decomposition temperature	:	No data available
Flammability (solid, gas)	:	No data available
Vapor pressure	:	Not applicable.
Vapor pressure at 50 °C	:	No data available
Critical pressure	:	5043 kPa
Relative vapor density at 20 °C	:	No data available
Relative density	:	1.1
Relative density of saturated gas/air mixture	:	No data available
Density	:	No data available
Relative gas density	:	1.1
Solubility	:	Water: 39 mg/l
Log Pow	:	Not applicable for inorganic gases.
Log Kow	:	No data available
Viscosity, kinematic	:	Not applicable.
Viscosity, dynamic	:	Not applicable.
Viscosity, kinematic (calculated value) (40 °C)	:	No data available
Explosive properties	:	Not applicable.
Oxidizing properties	:	Oxidizer.
Explosive limits	:	Non flammable.
Lower explosive limit (LEL)	:	No data available
Upper explosive limit (UEL)	:	No data available

9.2. Other information

Gas group	:	Refrigerated liquefied gas
Additional information	:	Gas/vapor heavier than air. May accumulate in confined spaces, particularly at or below ground level

SECTION 10: Stability and reactivity

10.1. Reactivity

Reactivity	:	No reactivity hazard other than the effects described in sub-sections below.
Chemical stability	:	Stable under normal conditions.
Possibility of hazardous reactions	:	Risk of explosion if spilt on organic structural materials (e.g. wood or asphalt). Violently oxidizes organic material.
Conditions to avoid	:	None under recommended storage and handling conditions (see section 7).
Incompatible materials	:	May react violently with combustible materials. May react violently with reducing agents. Consider the potential toxicity hazard due to the presence of chlorinated or fluorinated polymers in high pressure (> 30 bar) oxygen lines in case of combustion. Keep equipment free from oil and grease. For additional information on compatibility refer to ISO 11114. Consult supplier for specific recommendations.
Hazardous decomposition products	:	None.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity (oral)	:	Not classified
Acute toxicity (dermal)	:	Not classified
Acute toxicity (inhalation)	:	Not classified
Skin corrosion/irritation	:	Not classified
Serious eye damage/irritation	:	Not classified
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified

Carcinogenicity	:	Not classified
Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified
Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified

SECTION 12: Ecological information

12.1. Toxicity

Ecology - general : No ecological damage caused by this product.

12.2. Persistence and degradability

Oxygen (refrigerated liquid) (7782-44-7)

Persistence and degradability : No ecological damage caused by this product.

12.3. Bio accumulative potential

Oxygen (refrigerated liquid) (7782-44-7)

Log Pow : Not applicable for inorganic gases.

Bio accumulative potential : No ecological damage caused by this product.

12.4. Mobility in soil

Oxygen (refrigerated liquid) (7782-44-7)

Log Pow : Not applicable for inorganic gases.

Ecology - soil : No ecological damage caused by this product.

12.5. Other adverse effects

Other adverse effects : Can cause frost damage to vegetation.

SECTION 13: Disposal considerations

13.1. Disposal methods

Waste treatment methods : Consult supplier for specific recommendations. May be vented to atmosphere in a well ventilated place. Do not discharge into any place where its accumulation could be dangerous.

Additional information : None.

SECTION 14: Transport information

14.1. Basic shipping description

In accordance with TDG

Transportation of Dangerous Goods

UN-No. (TDG)	:	UN1073
TDG Primary Hazard Classes	:	2.2 - Class 2.2 - Non-Flammable, Non-Toxic Gas.
TDG Subsidiary Classes	:	5.1
Transport Document Description	:	UN1073 OXYGEN, REFRIGERATED LIQUID, 2.2
Proper Shipping Name	:	OXYGEN, REFRIGERATED LIQUID
Hazard labels (TDG)	:	2.2 - Non-flammable, non-toxic gases 5.1 - Oxidizing substances

TDG Special Provisions	:	87 - Despite the word “Forbidden” in column 9 of Schedule 1, these dangerous goods may be transported on a passenger carrying road vehicle or a passenger carrying railway vehicle in accordance with section 1.15 of Part 1, Coming into Force, Repeal, Interpretation, General Provisions and Special Cases, when they are used for medical purposes during transport and are in a means of containment with a capacity less than or equal to 1 L. SOR/2008-34
ERAP Index	:	3 000
Explosive Limit and Limited Quantity Index	:	0
Passenger Carrying Ship Index	:	450 kg
Excepted quantities (TDG)	:	E0
Passenger Carrying Road Vehicle or Passenger	:	Forbidden

Carrying Railway Vehicle Index

14.2. Transport information/DOT - USA

Department of Transport

DOT NA no.	:	UN1073
UN-No.(DOT)	:	1073
Transport Document Description	:	UN1073 Oxygen, refrigerated liquid (cryogenic liquid), 2.2
Proper Shipping Name (DOT)	:	Oxygen, refrigerated liquid (cryogenic liquid)
Contains Statement Field Selection (DOT)	:	
Class (DOT)	:	2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
Division (DOT)	:	2.2
Hazard labels (DOT)	:	2.2 - Non-flammable gas 5.1 - Oxidiser

Dangerous for the environment	:	No
DOT Special Provisions (49 CFR 172.102)	:	T75 - When portable tank instruction T75 is referenced in Column (7) of the 172.101 Table, the applicable refrigerated liquefied gases are authorized to be transported in portable tanks in accordance with the requirements of 178.277 of this subchapter TP5 - For a portable tank used for the transport of flammable refrigerated liquefied gases or refrigerated liquefied oxygen, the maximum rate at which the portable tank may be filled must not exceed the liquid flow capacity of the primary pressure relief system rated at a pressure not exceeding 120 percent of the portable tank's design pressure. For portable tanks used for the transport of refrigerated liquefied helium and refrigerated liquefied atmospheric gas (except oxygen), the maximum rate at which the tank is filled must not exceed the liquid flow capacity of the pressure relief device rated at 130 percent of the portable tank's design pressure. Except for a portable tank containing refrigerated liquefied helium, a portable tank shall have an outage of at least two percent below the inlet of the pressure relief device or pressure control valve, under conditions of incipient opening, with the portable tank in a level attitude. No outage is required for helium TP22 - Lubricants for portable tank fittings (for example, gaskets, shut-off valves, flanges) must be oxygen compatible
DOT Packaging Exceptions (49 CFR 173.xxx)	:	320
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	316
DOT Packaging Bulk (49 CFR 173.xxx)	:	318

DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	Forbidden
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	Forbidden
DOT Vessel Stowage Location	:	D - The material must be stowed ''on deck only'' on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers or one passenger per each 3 m of overall vessel length, but the material is prohibited on passenger vessels in which the limiting number of passengers is exceeded.
Emergency Response Guide (ERG) Number	:	122
Special transport precautions	:	Avoid transport on vehicles where the load space is not separated from the driver's compartment. Ensure vehicle driver is aware of the potential hazards of the load and knows what to do in the event of an accident or an emergency. Before transporting product containers: - Ensure there is adequate ventilation. - Ensure that containers are firmly secured. - Ensure cylinder valve is closed and not leaking. - Ensure valve outlet cap nut or plug (where provided) is correctly fitted. - Ensure valve protection device (where provided) is correctly fitted.
Other information	:	No supplementary information available.

14.3. Air and sea transport

IMDG

UN-No. (IMDG)	:	1073
Proper Shipping Name (IMDG)	:	OXYGEN, REFRIGERATED LIQUID
Class (IMDG)	:	2 - Gases
MFAG-No	:	122
Ship Safety Act	:	Gases under pressure/Gases nonflammable nontoxic under pressure(Dangerous Goods Notification Schedule first second and third Article Dangerous Goods Regulations)
Port Regulation Law	:	Hazardous materials/High pressure gas (Article 21, Paragraph 2 of Law, Article 12 rule, notice attached table that defines the type of dangerous goods)

IATA

UN-No. (IATA)	:	1073
Proper Shipping Name (IATA)	:	Oxygen, refrigerated liquid
Class (IATA)	:	2
Civil Aeronautics Law	:	Gases under pressure/Gases nonflammable nontoxic under pressure(Hazardous materials notice Appended Table 1 Article 194 of the Enforcement Regulations)

SECTION 15: Regulatory information

15.1. International regulations

Oxygen (refrigerated liquid) (7782-44-7)
Listed on the AICS (Australian Inventory of Chemical Substances)
Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China)
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)
Listed on NZIoC (New Zealand Inventory of Chemicals)
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)
Listed on the United States TSCA (Toxic Substances Control Act) inventory
Listed on INSQ (Mexican National Inventory of Chemical Substances)

Full text of H-statements:

H270	May cause or intensify fire; oxidizer
H281	Contains refrigerated gas; may cause cryogenic burns or injury