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MATERIAL SAFETY DATA SHEET

No. 170

PRODUCT NAME Greater Than 23.5 % Oxygen in Helium	CAS # O ₂ = 7782-42-7 He= 7440-59-7
TRADE NAME AND SYNONYMS Rare Gas and Oxygen Mixture (D.O.T.)	DOT I.D. No.: UN 1980
CHEMICAL NAME AND SYNONYMS > 23.5 Molar % Oxygen in Helium	DOT Hazard Class: Division 2.2
ISSUE DATES AND REVISIONS April 1997	Formula > 23.5 Molar % O ₂ in He Chemical Family: Gas Mixtures

HEALTH HAZARD DATA

<p>TIME WEIGHTED AVERAGE EXPOSURE LIMIT Helium is a simple asphyxiant (ACGIH 1996); and Oxygen is the "vital element" in the atmosphere in which we live and breathe. (Continued on Page 4)</p>
<p>SYMPTOMS OF EXPOSURE Breathing high concentrations (greater than 75 Molar % Oxygen) causes symptoms of hyperoxia which includes cramps, nausea, dizziness, hypothermia, amblyopia, respiratory difficulties, bradycardia, fainting spells, and convulsions capable of leading to death. For additional information on hyperoxia, see Compressed Gas Association's Pamphlet P-14.</p>
<p>TOXICOLOGICAL PROPERTIES The property is that of hyperoxia which leads to pneumonia. Concentrations between 25 and 75 molar percent oxygen present a risk of inflammation of organic matter in the body. Neither oxygen or helium are listed in the IARC, NTP or by OSHA as a carcinogen or potential carcinogen. Persons in ill health where such illness would be aggravated by these mixtures should not be allowed to work with or handle these products.</p>
<p>RECOMMENDED FIRST AID TREATMENT PROMPT MEDICAL ATTENTION IS MANDATORY IN ALL CASES OF OVEREXPOSURE TO THESE MIXTURES. RESCUE PERSONNEL SHOULD BE COGNIZANT OF EXTREME FIRE HAZARD ASSOCIATED WITH OXYGEN RICH ATMOSPHERES. Conscious persons should be assisted to an uncontaminated area and breathe fresh air. They should be kept warm and quiet. The physician should be informed that the victim is experiencing (has experienced) hyperoxia. Unconscious persons should be moved to an uncontaminated area and given assisted respiration. When breathing has been restored, treatment should be as above. Continued treatment should be symptomatic and supportive.</p>

Information contained in this material safety data sheet is offered without charge for use by technically qualified personnel at their discretion and risk. All statements, technical information and recommendations contained herein are based on tests and data which we believe to be reliable, but the accuracy or completeness thereof is not guaranteed and no warranty of any kind is made with respect thereto. This information is not intended as a license to operate under or a recommendation to practice or infringe any patent of this Company or others covering any process, composition of matter or use. Since the Company shall have no control of the use of the product described herein, the Company assumes no liability for loss or damage incurred from the proper or improper use of such product.

HAZARDOUS MIXTURES OF OTHER LIQUIDS, SOLIDS, OR GASES

These mixtures vigorously accelerate combustion. Contact with all flammable material should be avoided. Some materials which are not flammable in air will burn in oxygen enriched atmospheres.

PHYSICAL DATA

BOILING POINT O ₂ = -297.3°F (-182.9°C) He = -452.1°F (-268.9°C)	LIQUID DENSITY AT BOILING POINT See Page 4
VAPOR PRESSURE See Page 4	GAS DENSITY AT 70°F, 1 atm See Page 4
SOLUBILITY IN WATER O ₂ = slightly He = negligible	FREEZING POINT See Page 4
EVAPORATION RATE N/A (Gas)	SPECIFIC GRAVITY (AIR=1) See Page 4
APPEARANCE AND ODOR Colorless, odorless gas	

FIRE AND EXPLOSION HAZARD DATA

FLASH POINT (Method used) N/A	AUTO IGNITION TEMPERATURE N/A	FLAMMABLE LIMITS % BY VOLUME (See Page 4) LE N/A UEL N/A
EXTINGUISHING MEDIA Copious quantities of water for fires with this mixture as the oxidizer.		ELECTRICAL CLASSIFICATION Nonhazardous
SPECIAL FIRE FIGHTING PROCEDURES If possible, stop the flow of this mixture which is supporting the fire. If cylinders are involved in a fire, safely relocate or keep cool with water spray.		
UNUSUAL FIRE AND EXPLOSION HAZARDS Vigorously accelerates combustion.		

REACTIVITY DATA

STABILITY Unstable		CONDITIONS TO AVOID None
Stable	X	
INCOMPATIBILITY (Materials to avoid) All flammable materials		
HAZARDOUS DECOMPOSITION PRODUCTS None		
HAZARDOUS POLYMERIZATION May Occur		CONDITIONS TO AVOID None
Will Not Occur	X	

SPILL OR LEAK PROCEDURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED Evacuate all personnel from the affected area. Use appropriate protective equipment. If leak is in user's equipment, be certain to purge piping with an inert gas prior to attempting repairs. If leak is in container or container valve, contact your closest supplier location or call the emergency telephone number listed herein.
WASTE DISPOSAL METHOD Do not attempt to dispose of waste or unused quantities. Return in the shipping container <u>property labeled, with any valve-outlet plugs or caps secured and valve protection cap in place</u> to your supplier. For emergency disposal assistance, contact your closest supplier location or call the emergency telephone number listed herein.

SPECIAL PROTECTION INFORMATION

RESPIRATORY PROTECTION (Specify type) N/A					
VENTILATION See local exhaust	<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 40%;">LOCAL EXHAUST To prevent accumulation above 25 molar percent oxygen</td> <td style="width: 60%;">SPECIAL N/A</td> </tr> <tr> <td>MECHANICAL (Gen.) N/A</td> <td>OTHER N/A</td> </tr> </table>	LOCAL EXHAUST To prevent accumulation above 25 molar percent oxygen	SPECIAL N/A	MECHANICAL (Gen.) N/A	OTHER N/A
LOCAL EXHAUST To prevent accumulation above 25 molar percent oxygen	SPECIAL N/A				
MECHANICAL (Gen.) N/A	OTHER N/A				
PROTECTIVE GLOVES As required, any material					
EYE PROTECTION Safety goggles or glasses					
OTHER PROTECTIVE EQUIPMENT Safety shoes, safety shower					

SPECIAL PRECAUTIONS*

<p>SPECIAL LABELING INFORMATION</p> <p>DOT Shipping Name: Rare Gas and Oxygen Mixture DOT Hazard Class: Division 2 DOT Shipping Labels: Nonflammable Gas; Oxidizer I.D. No.: UN 1980</p>
<p>SPECIAL HANDLING RECOMMENDATIONS</p> <p>Use only in well-ventilated areas. Valve protection caps and valve outlet threaded plugs must remain in place unless container is secured with a valve outlet piped to use point. Do not drag, slide or roll cylinders. Use a suitable hand truck for cylinder movement. Use a pressure reducing regulator when connecting cylinder to lower pressure (<3,000 psig) piping or systems. Do not heat cylinder by any means to increase the discharge rate of product from the cylinder. Use a check valve or trap in the discharge line to prevent hazardous back flow into the cylinder.</p> <p>For additional handling recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14, and G-4.</p>
<p>SPECIAL STORAGE RECOMMENDATIONS</p> <p>Protect cylinders from physical damage. Store in cool, dry, well-ventilated area away from heavily trafficked area and emergency exits and away from full or empty stored cylinders which contain flammable products. Do not allow the temperature where cylinders are stored to exceed 125°F (52°C). Cylinders should be stored upright and firmly secured to prevent falling or being knocked over. Full and empty cylinders should be segregated. Use a "first in first out" inventory system to prevent full cylinders being stored for excessive periods of time.</p> <p>For additional storage recommendations, consult Compressed Gas Association's Pamphlets P-1, P-14, and G-4.</p>
<p>SPECIAL PACKAGING RECOMMENDATIONS</p> <p>Carbon steels and low alloy steels are acceptable for use at lower pressures. For high pressure applications use stainless steels, copper and its alloys, nickel and its alloys, brass, bronze, silicon alloys, Monel®, Inconel®, or beryllium. Lead and silver or lead and tin alloys are good gasketing materials. Teflon® and Kel-F® are the preferred nonmetal gaskets.</p> <p>Special Note: It should be recognized that the ignition temperature of metals and nonmetals in high oxygen content service decreases with increasing oxygen pressure.</p>
<p>OTHER RECOMMENDATIONS OR PRECAUTIONS</p> <p>These mixtures should not be used as a substitute for compressed air in pneumatic equipment since this type generally contains flammable lubricants. Equipment to contain these mixtures must be "cleaned for oxygen service". See Compressed Gas Association Pamphlet G-4.1.</p> <p>Compressed gas cylinders should not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder</p> <p style="text-align: right;">(Continued on Page 4)</p>

*Various Government Agencies (i.e. Department of Transportation, Occupational Safety and Health Administration, Food and Drug Administration and others) may have specific regulations concerning the transportation, handling, storage or use of this product which will not be reflected in this data sheet. The customer should review these regulations to ensure that he is in full compliance.

Greater Than 23.5 % Oxygen in Helium

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE EXPOSURE LIMIT: (Continued)

OSHA 1996 does not list a PEL (8 hr. TWA) for Helium or Oxygen.

PHYSICAL DATA: (Continued)

LIQUID DENSITY AT BOILING POINT: O₂ = 71.23 lb/ti³ (1141 kg/m³)
He = 7.80 lb/ft³ (124.9 kg/m³)

VAPOR PRESSURE @ 70°F: O₂= Above the critical temp. of -181.1°F(-118.4°C)
He= Above the critical temp. of -450.2°F(-250.1°C)

GAS DENSITY AT 70°F. 1 ATM: O₂= .0828 lb/ft³ (1.326 kg/m³)
He= .01034 lb/ft³ (.1656 kg/m³)

FREEZING POINT: O₂= -361.8°F (-218.8°C)
He λ Pt.= -455.8°F (-271°C)

SPECIFIC GRAVITY (AIR =1) @ 70°F (21.1°C):
O₂= 1.11
He= .138

SPECIAL PRECAUTIONS:

OTHER RECOMMENDATIONS OR PRECAUTIONS: (Continued)

which has not been filled by the owner or with his(written) consent is a violation of Federal Law (49CFR).

Always secure cylinders in an upright position before transporting them. NEVER transport cylinders in trunks of vehicles, enclosed vans, truck cabs or in passenger compartments Transport cylinders secured in open flatbed or in open pick-up type vehicles.

Reporting under SARA, Title III, Section 313 not required.

NFPA 704 No. for these mixtures = 1 0 0 OX