

Treball de Fi de Grau

Grau en Enginyeria Química

Estabilització del compost farmacèutic Stiripentol mitjançant excipients polimèrics

ANNEXES

Autor: Guillem Pascual Herencia

Director: Roberto Macovez

Convocatòria: Juny 2017



Escola Tècnica Superior
d'Enginyeria Industrial de Barcelona



Resum

Els annexes presentats a continuació contenen:

- Preparació de les mostres de DSC, BDS i difracció de Raigs-X.
- Fitxes de seguretat dels compostos analitzats o que han participat en els diferents anàlisis.

Sumari

RESUM	3
SUMARI	4
A. PREPARACIÓ DE LES MOSTRES	5
A.1 Preparació mostres de DSC	5
A.2 Preparació mostres de BDS.....	6
A.3 Preparació mostres de Difracció de Raigs-X	7
B. FITXES DE SEGURETAT	8
B.1 Fitxa de Seguretat del Stiripentol	8
B.2 Fitxa de Seguretat de l'Àcid Polilàctic.....	13
B.3 Fitxa de Seguretat del Nitrogen líquid	18
B.4 Fitxa de Seguretat de l'Heli	25
B.5 Fitxa de Seguretat del Oxigen.....	33

A. Preparació de les mostres

En aquest projecte s'han analitzat mostres de diferents concentracions de Stiripentol i PLA. En aquest annex s'explica la preparació de totes aquestes mostres.

Per la mescla de Stiripentol i PLA s'utilitza un dissolvent polar, ja que el PLA es una substància polar insoluble en aigua, de base cloroform i acetona, en proporció 9:1. La funció de la acetona es posteriorment ajudar dissoldre el Stiripentol, que té un temps de dissolució molt elevat, i per tal d'obtenir una major uniformitat al posteriorment dipositar la mescla sobre determinades superfícies.

L'àcid polilàctic es dissol amb el dissolvent amb una concentració final de PLA del 2.5% en pes (2.5g de PLA per 100 ml de dissolvent). Posteriorment s'afegeix el Stiripentol, en format pols, en concentracions del 5%, 7.5%, 10%, 20% i 30%. També es prepara una mescla sense Stiripentol. Un cop dipositades les mescles de diferent concentracions sobre plaques un determinat substrat (vidre o discs de plata), aquestes es deixen durant 3h en l'interior d'un assecador, que evapora el dissolvent i deixa una capa fina de Stiripentol i PLA sobre el substrat. Es deixa evaporar el dissolvent en el dessecador i no en l'exterior per tal de que les mostres entrin contacte amb la humitat.

Un cop s'han preparat les mostres, es deixen reposar durant 24h, temps que triga el Stiripentol en dissoldre's en la mescla. Degut a la volatilitat del Stiripentol, i a que el PLA es biodegradable, les mostres s'han de conservar en frigorífic, tancant els recipients amb polifilm per evitar que entri la humitat de la nevera.

A.1 Preparació mostres de DSC

Les mescles de diferents concentracions de Stiripentol es dipositen sobre un vidre de laboratori, creant una capa el més espessa possible, però sense que importi el valor de l'espessor. Un cop s'ha evaporat el dissolvent i s'ha creat un film sòlid, aquest es retirat

del vidre i guardat en càpsules dins del frigorífic fins que s'analitzin.

Per l'anàlisi de DSC, la mostra a estudiar, en aquest cas en format film, s'ha de compactar i introduir dins d'unes càpsules o gresols d'alumini. Es recomana introduir com a mínim 2 mg de mostra. Un cop pesada la matèria introduïda, es tanca la càpsula de forma hermètica. Es pot veure un exemple de càpsula d'alumini en la *figura A.1*.



Figura A.1 càpsules d'Alumini per anàlisi de DSC.

A.2 Preparació mostres de BDS

Les mescles de diferent concentració de Stiripentol i PLA es dipositen sobre uns discs de plata, amb el màxim espessor possible. En aquest cas si que es essencial conèixer el valor de l'espessor de cada mostra, ja que els resultats obtinguts per BDS dependran de la geometria de la mostra. Un cop s'ha evaporat el dissolvent i s'ha creat un film de Stiripentol i PLA, es guarden al frigorífic, prenent precaucions per evitar el contacte amb la humitat fins al moment de l'anàlisi.

El disc sobre el que s'ha dipositat la mostra actua com una de les plaques d'un condensador, i la mescla es el medi dielèctric. Es col·loca un altre disc, que actua com la segona placa del condensador, i es diposita el conjunt en un suport connectat a l'entrada del nitrogen, als sensors de temperatura i a l'electrònica que mesura la resposta dielèctrica obtinguda.


A.3 Preparació mostres de Difracció de Raigs-X

Les mostres de Difracció es preparen pel mateix mètode que les mostres de DSC, amb l'única diferència que el film de Stiripentol i PLA no es retira del vidre. No es important el valor del espessor del film, però sí que les dimensions del vidre no poden excedir els 2.5 cm per cada costat, ja que es la grandària màxima que accepta el difractòmetre del que s'ha disposat per les mesures.

Donat a que el vidre dona senyal en l'anàlisi de difracció, s'ha tallat un tros de vidre de laboratori sense mescla, per analitzar i poder restar la seva resposta a les mostres analitzades.

B. Fitxes de Seguretat

B.1 Fitxa de Seguretat del Stiripentol

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008	
Section 1. Identification of the Substance/Mixture and of the Company/Undertaking	
1.1	Product Code: 17781 Product Name: Stiripentol Synonyms: BCX 2600;
1.2	Relevant identified uses of the substance or mixture and uses advised against: Relevant identified uses: For research use only, not for human or veterinary use.
1.3	Details of the Supplier of the Safety Data Sheet: Company Name: Cayman Chemical Company 1180 E. Ellsworth Rd. Ann Arbor, MI 48108 Web site address: www.caymanchem.com Information: Cayman Chemical Company +1 (734)971-3335
1.4	Emergency telephone number: Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300 CHEMTREC Outside USA and Canada: +1 (703)527-3887
Section 2. Hazards Identification	
2.1	Classification of the Substance or Mixture: Acute Toxicity: Oral, Category 4
2.2	Label Elements:  GHS Signal Word: Warning GHS Hazard Phrases: H302: Harmful if swallowed. GHS Precaution Phrases: P264: Wash {hands} thoroughly after handling. GHS Response Phrases: P301+312: IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell. P330: Rinse mouth. GHS Storage and Disposal Phrases: Please refer to Section 7 for Storage and Section 13 for Disposal information.
2.3	Adverse Human Health Harmful if swallowed. Effects and Symptoms: Material may be irritating to the mucous membranes and upper respiratory tract. May be harmful by inhalation or skin absorption. May cause eye, skin, or respiratory system irritation. To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients				
CAS # / RTECS #	Hazardous Components (Chemical Name)/ REACH Registration No.	Concentration	EC No./ EC Index No.	GHS Classification
49763-96-4 SB3393000	stiripentol	100.0 %	256-480-9 NA	Acute Tox.(O) 4: H302
Section 4. First Aid Measures				
<p>4.1 Description of First Aid Measures:</p> <p>In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.</p> <p>In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.</p> <p>In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.</p> <p>In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.</p>				
Section 5. Fire Fighting Measures				
<p>5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray. Use water spray to cool fire-exposed containers.</p> <p>Unsuitable Extinguishing Media: A solid water stream may be inefficient.</p> <p>5.2 Flammable Properties and Hazards: No data available.</p> <p>Flash Pt: No data.</p> <p>Explosive Limits: LEL: No data. UEL: No data.</p> <p>Autoignition Pt: No data.</p> <p>5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.</p>				
Section 6. Accidental Release Measures				
<p>6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).</p> <p>6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.</p> <p>6.3 Methods and Material For Containment and Cleaning Up: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.</p>				

Section 7. Handling and Storage

- 7.1 Precautions To Be Taken** Avoid breathing dust/fume/gas/mist/vapours/spray.
in Handling: Avoid prolonged or repeated exposure.
- 7.2 Precautions To Be Taken** Keep container tightly closed.
in Storing: Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

CAS #	Partial Chemical Name	Britain EH40	France VL	Europe
49763-96-4	stiripentol	No data.	No data.	No data.
CAS #	Partial Chemical Name	OSHA TWA	ACGIH TWA	Other Limits
49763-96-4	stiripentol	No data.	No data.	No data.

8.2 Exposure Controls:

- 8.2.1 Engineering Controls** Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne (Ventilation etc.): levels below recommended exposure limits.
- 8.2.2 Personal protection equipment:**
- Eye Protection:** Safety glasses
- Protective Gloves:** Compatible chemical-resistant gloves
- Other Protective Clothing:** Lab coat
- Respiratory Equipment** NIOSH approved respirator, as conditions warrant.
(Specify Type):
- Work/Hygienic/Maintenance Practices:** Do not take internally.
 Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower.
 Wash thoroughly after handling.
 No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

- Physical States:** Gas Liquid Solid
- Appearance and Odor:** A crystalline solid
- Melting Point:** No data.
- Boiling Point:** No data.
- Flash Pt:** No data.
- Evaporation Rate:** No data.
- Flammability (solid, gas):** No data available.
- Explosive Limits:** LEL: No data. UEL: No data.
- Vapor Pressure (vs. Air or mm Hg):** No data.
- Vapor Density (vs. Air = 1):** No data.
- Specific Gravity (Water = 1):** No data.
- Solubility in Water:** No data.
- Solubility Notes:** ~0.5 mg/ml in 1:1 ethanol:PBS (pH 7.2); ~30 mg/ml in ethanol; ~50 mg/ml in DMSO & DMF;

Autoignition Pt:	No data.				
9.2 Other Information					
Percent Volatile:	No data.				
Molecular Formula & Weight:	C14H18O3	234.3			
Section 10. Stability and Reactivity					
10.1 Reactivity:	No data available.				
10.2 Stability:	Unstable [] Stable [X]				
10.3 Stability Note(s):	Stable if stored in accordance with information listed on the product insert.				
Polymerization:	Will occur [] Will not occur [X]				
10.4 Conditions To Avoid:	No data available.				
10.5 Incompatibility - Materials To Avoid:	No data available.				
10.6 Hazardous Decomposition or Byproducts:	carbon oxides				
Section 11. Toxicological Information					
11.1 Information on Toxicological Effects:	The toxicological effects of this compound have not been thoroughly studied.				
Chronic Toxicological Effects:	Stiripentol - Toxicity Data: Oral LD50 (rat): >3 g/kg;				
	Stiripentol - Investigated as a reproductive effector.				
	Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here.				
	See actual entry in RTECS for complete information.				
	Stiripentol RTECS Number: SB3393000				
CAS #	Hazardous Components (Chemical Name)	NTP	IARC	ACGIH	OSHA
49763-96-4	stiripentol	n.a.	n.a.	n.a.	n.a.
Section 12. Ecological Information					
12.1 Toxicity:	Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.				
12.2 Persistence and Degradability:	No data available.				
12.3 Bioaccumulative Potential:	No data available.				
12.4 Mobility in Soil:	No data available.				
12.5 Results of PBT and vPvB assessment:	No data available.				
12.6 Other adverse effects:	No data available.				

Section 13. Disposal Considerations				
13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.				
Section 14. Transport Information				
14.1 LAND TRANSPORT (US DOT):				
DOT Proper Shipping Name: Not dangerous goods.				
DOT Hazard Class:				
UN/NA Number:				
14.1 LAND TRANSPORT (European ADR/RID):				
ADR/RID Shipping Name: Not dangerous goods.				
UN Number:				
Hazard Class:				
14.3 AIR TRANSPORT (ICAO/IATA):				
ICAO/IATA Shipping Name: Not dangerous goods.				
Additional Transport Information: Transport in accordance with local, state, and federal regulations.				
Section 15. Regulatory Information				
EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists				
CAS #	Hazardous Components (Chemical Name)	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
49763-96-4	stiripentol	No	No	No
CAS #	Hazardous Components (Chemical Name)	Other US EPA or State Lists		
49763-96-4	stiripentol	CAA HAP,ODC: No; CWA NPDES: No; TSCA: No; CA PROP.65: No		
Regulatory Information Statement:		This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.		
Section 16. Other Information				
Revision Date:		06/05/2015		
Additional Information About This Product:		No data available.		
Company Policy or Disclaimer:		DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.		

B.2 Fitxa de Seguretat de l'Àcid Polilàctic

SIGMA-ALDRICH		<small>sigma-aldrich.com</small>	
		Material Safety Data Sheet	
		<small>Version 4.1 Revision Date 03/15/2011 Print Date 04/01/2011</small>	
1. PRODUCT AND COMPANY IDENTIFICATION			
Product name	:	Poly(D,L-lactide)	
Product Number	:	531162	
Brand	:	Aldrich	
Supplier	:	Sigma-Aldrich 3050 Spruce Street SAINT LOUIS MO 63103 USA	
Telephone	:	+18003255832	
Fax	:	+18003255052	
Emergency Phone # (For both supplier and manufacturer)	:	(314) 776-6555	
Preparation Information	:	Sigma-Aldrich Corporation Product Safety - Americas Region 1-800-521-8956	
2. HAZARDS IDENTIFICATION			
Emergency Overview			
OSHA Hazards			
No known OSHA hazards			
Not a dangerous substance or mixture according to the Globaly Harmonised System (GHS).			
HMIS Classification			
Health hazard:	:	0	
Flammability:	:	0	
Physical hazards:	:	0	
NFPA Rating			
Health hazard:	:	0	
Fire:	:	0	
Reactivity Hazard:	:	0	
Potential Health Effects			
Inhalation	:	May be harmful if inhaled. May cause respiratory tract irritation.	
Skin	:	May be harmful if absorbed through skin. May cause skin irritation.	
Eyes	:	May cause eye irritation.	
Ingestion	:	May be harmful if swallowed.	
3. COMPOSITION/INFORMATION ON INGREDIENTS			
Formula	:	(C ₃ H ₄ O ₂) _n	
CAS-No.	EC-No.	Index-No.	Concentration
Poly(D,L-lactide)			
26023-30-3	-	-	-
4. FIRST AID MEASURES			
Aldrich - 531162		Page 1 of 6	

If inhaled

If breathed in, move person into fresh air. If not breathing, give artificial respiration.

In case of skin contact

Wash off with soap and plenty of water.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Never give anything by mouth to an unconscious person. Rinse mouth with water.

5. FIRE-FIGHTING MEASURES**Conditions of flammability**

Not flammable or combustible.

Suitable extinguishing media

Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Special protective equipment for fire-fighters

Wear self contained breathing apparatus for fire fighting if necessary.

Hazardous combustion products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

6. ACCIDENTAL RELEASE MEASURES**Personal precautions**

Avoid dust formation. Avoid breathing vapors, mist or gas.

Environmental precautions

Do not let product enter drains.

Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

7. HANDLING AND STORAGE**Precautions for safe handling**

Provide appropriate exhaust ventilation at places where dust is formed.

Conditions for safe storage

Keep container tightly closed in a dry and well-ventilated place.

Recommended storage temperature: -20 °C

Handle and store under inert gas. Moisture sensitive.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Contains no substances with occupational exposure limit values.

Personal protective equipment**Respiratory protection**

Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Hand protection

Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices. Wash and dry hands.

Eye protection

Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place.. The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Hygiene measures

General industrial hygiene practice.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance

Form	Beads
Colour	light yellow

Safety data

pH	no data available
Melting point/freezing point	Melting point/range: 262 °C (504 °F)
Boiling point	no data available
Flash point	no data available
Ignition temperature	no data available
Autoignition temperature	no data available
Lower explosion limit	no data available
Upper explosion limit	no data available
Vapour pressure	no data available
Density	no data available
Water solubility	no data available
Partition coefficient: n-octanol/water	no data available
Relative vapour density	no data available
Odour	no data available
Odour Threshold	no data available
Evaporation rate	no data available

10. STABILITY AND REACTIVITY

Chemical stability

Stable under recommended storage conditions.

Possibility of hazardous reactions

no data available

Conditions to avoid

no data available

Materials to avoid

acids, Bases

Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides

Other decomposition products - no data available

11. TOXICOLOGICAL INFORMATION

Acute toxicity**Oral LD50**

no data available

Inhalation LC50

no data available

Dermal LD50

no data available

Other information on acute toxicity

no data available

Skin corrosion/irritation

no data available

Serious eye damage/eye irritation

no data available

Respiratory or skin sensitization

no data available

Germ cell mutagenicity

no data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

ACGIH: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by ACGIH.

NTP: No component of this product present at levels greater than or equal to 0.1% is identified as a known or anticipated carcinogen by NTP.

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

no data available

Teratogenicity

no data available

Specific target organ toxicity - single exposure (Globally Harmonized System)

no data available

Specific target organ toxicity - repeated exposure (Globally Harmonized System)

no data available

Aspiration hazard

no data available

Potential health effects**Inhalation**

May be harmful if inhaled. May cause respiratory tract irritation.

Ingestion

May be harmful if swallowed.

Skin

May be harmful if absorbed through skin. May cause skin irritation.

Eyes

May cause eye irritation.

Synergistic effects

no data available

Additional Information

RTECS: Not available

12. ECOLOGICAL INFORMATION

Toxicity

no data available

Persistence and degradability

no data available

Bioaccumulative potential

no data available

Mobility in soil

no data available

PBT and vPvB assessment

no data available

Other adverse effects

no data available

13. DISPOSAL CONSIDERATIONS

Product

Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

Not dangerous goods

IMDG

Not dangerous goods

IATA

Not dangerous goods

15. REGULATORY INFORMATION

OSHA Hazards

No known OSHA hazards

SARA 302 Components

SARA 302: No chemicals in this material are subject to the reporting requirements of SARA Title III, Section 302.

SARA 313 Components

SARA 313: This material does not contain any chemical components with known CAS numbers that exceed the threshold (De Minimis) reporting levels established by SARA Title III, Section 313.

SARA 311/312 Hazards

No SARA Hazards

Massachusetts Right To Know Components

No components are subject to the Massachusetts Right to Know Act.

Pennsylvania Right To Know Components

Poly(D,L-lactide)

CAS-No.
26023-30-3

Revision Date


New Jersey Right To Know Components


Poly(D,L-lactide)

CAS-No.
26023-30-3

Revision Date

B.3 Fitxa de Seguretat del Nitrogen Líquid

 Nitrogen, refrigerated liquid Safety Data Sheet P-4630 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014	
SECTION 1: Product and company identification	
1.1. Product identifier	
Product form	: Substance
Name	: Nitrogen, refrigerated liquid
CAS No	: 7727-37-9
Formula	: N ₂
Other means of identification	: Nitrogen (cryogenic liquid), Nitrogen, Medipure Liquid Nitrogen
1.2. Relevant identified uses of the substance or mixture and uses advised against	
Use of the substance/mixture	: Medical applications Industrial use Food applications
1.3. Details of the supplier of the safety data sheet	
	Praxair, Inc. 10 Riverview Drive Danbury, CT 06810-6268 - USA T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146 www.praxair.com
1.4. Emergency telephone number	
Emergency number	: Onsite Emergency: 1-800-645-4633 CHEMTREC, 24hr/day 7days/week — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)
SECTION 2: Hazard identification	
2.1. Classification of the substance or mixture	
GHS-US classification Refrigerated liquefied gas H281	
2.2. Label elements	
GHS-US labeling	
Hazard pictograms (GHS-US)	:  GHS04
Signal word (GHS-US)	: WARNING
Hazard statements (GHS-US)	: H281 - CONTAINS REFRIGERATED GAS; MAY CAUSE CRYOGENIC BURNS OR INJURY OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION
Precautionary statements (GHS-US)	: P202 - Do not handle until all safety precautions have been read and understood P271+P403 - Use and store only outdoors or in a well-ventilated place P282 - Wear cold insulating gloves/face shield/eye protection. cold insulating gloves, face shield, eye protection CGA-PG05 - Use a back flow preventive device in the piping CGA-PG24 - DO NOT change or force fit connections CGA-PG06 - Close valve after each use and when empty CGA-PG23 - Always keep container in upright position
2.3. Other hazards	
Other hazards not contributing to the	: Asphyxiant in high concentrations



Nitrogen, refrigerated liquid

Safety Data Sheet P-4630

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.
Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014

classification Contact with liquid may cause cold burns/frostbite.

2.4. Unknown acute toxicity (GHS US)
No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%
Nitrogen, refrigerated liquid (Main constituent)	(CAS No) 7727-37-9	100

3.2. Mixture
Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove victim to uncontaminated area wearing self contained breathing apparatus. Keep victim warm and rested. Call a doctor. Apply artificial respiration if breathing stopped.

First-aid measures after skin contact : The liquid may cause frostbite. For exposure to liquid, immediately warm frostbite area with warm water not to exceed 105°F (41°C). Water temperature should be tolerable to normal skin. Maintain skin warming for at least 15 minutes or until normal coloring and sensation have returned to the affected area. In case of massive exposure, remove clothing while showering with warm water. Seek medical evaluation and treatment as soon as possible.

First-aid measures after eye contact : Immediately flush eyes thoroughly with water for at least 15 minutes. Hold the eyelids open and away from the eyeballs to ensure that all surfaces are flushed thoroughly. Contact an ophthalmologist immediately.. Get immediate medical attention.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed
No additional information available

4.3. Indication of any immediate medical attention and special treatment needed
None.

SECTION 5: Firefighting measures

5.1. Extinguishing media
Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture
Reactivity : No reactivity hazard other than the effects described in sub-sections below.


5.3. Advice for firefighters


Firefighting instructions : DANGER! Extremely cold liquid and gas under pressure. Take care not to direct spray onto vents on top of container. Do not discharge sprays directly into liquid; cryogenic liquid can freeze water rapidly


Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

Protection during firefighting : Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.

Special protective equipment for fire fighters : Use self-contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

	
<h2 style="margin: 0;">Nitrogen, refrigerated liquid</h2> <h3 style="margin: 0;">Safety Data Sheet P-4630</h3>	
<p style="font-size: small;">This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014</p>	
<p>Specific methods</p>	<p>: Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems</p> <p>Exposure to fire may cause containers to rupture/explode</p> <p>Stop flow of product if safe to do so</p> <p>Use water spray or fog to knock down fire fumes if possible</p> <p>If leaking do not spray water onto container. Water surrounding area (from protected position) to contain fire.</p>
<p>Other information</p>	<p>: Cryogenic liquid causes severe frostbite, a burn-like injury. Heat of fire can build pressure in a closed container and cause it to rupture. Venting vapors may obscure visibility. Air will condense on surfaces such as vaporizers or piping exposed to liquid or cold gas. Nitrogen, which has a lower boiling point than oxygen, evaporates first, leaving an oxygen-enriched condensate</p> <p>Containers are equipped with a pressure relief device. (Exceptions may exist where authorized by DOT.).</p>
<p>SECTION 6: Accidental release measures</p>	
<p>6.1. Personal precautions, protective equipment and emergency procedures</p>	
<p>General measures</p>	<p>: Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Stop leak if safe to do so.</p>
<p>6.1.1. For non-emergency personnel</p>	<p>No additional information available</p>
<p>6.1.2. For emergency responders</p>	<p>No additional information available</p>
<p>6.2. Environmental precautions</p>	
<p>Try to stop release.</p>	
<p>6.3. Methods and material for containment and cleaning up</p>	
<p>No additional information available</p>	
<p>6.4. Reference to other sections</p>	
<p>See also sections 8 and 13.</p>	
<p>SECTION 7: Handling and storage</p>	
<p>7.1. Precautions for safe handling</p>	
<p>Precautions for safe handling</p>	<p>: Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.</p>

	
<h2 style="margin: 0;">Nitrogen, refrigerated liquid</h2> <h3 style="margin: 0;">Safety Data Sheet P-4630</h3> <p style="margin: 0; font-size: small;">This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014</p>	
7.2. Conditions for safe storage, including any incompatibilities	
<p>Storage conditions</p>	<p>: Store in a cool, well-ventilated place. Store and use with adequate ventilation. Store only where temperature will not exceed 125°F (52°C). Firmly secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods</p> <p>OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.</p>
7.3. Specific end use(s)	
<p>None.</p>	
SECTION 8: Exposure controls/personal protection	
8.1. Control parameters	
Nitrogen, refrigerated liquid (7727-37-9)	
ACGIH	Not established
USA OSHA	Not established
8.2. Exposure controls	
<p>Appropriate engineering controls</p> <p>Hand protection</p> <p>Eye protection</p> <p>Respiratory protection</p> <p>Thermal hazard protection</p> <p>Environmental exposure controls</p> <p>Other information</p>	<p>: Oxygen detectors should be used when asphyxiating gases may be released. Systems under pressure should be regularly checked for leakages. Provide adequate general and local exhaust ventilation. Consider work permit system e.g. for maintenance activities.</p> <p>: Wear working gloves when handling gas containers.</p> <p>: Wear safety glasses with side shields. Wear goggles and a face shield when transfilling or breaking transfer connections.</p> <p>: Self contained breathing apparatus (SCBA) or positive pressure airline with mask are to be used in oxygen-deficient atmospheres.</p> <p>: Wear cold insulating gloves. Wear cold insulating gloves when transfilling or breaking transfer connections.</p> <p>: None necessary.</p> <p>: Wear safety shoes while handling containers.</p>
SECTION 9: Physical and chemical properties	
9.1. Information on basic physical and chemical properties	
<p>Physical state</p> <p>Appearance</p> <p>Molecular mass</p> <p>Color</p> <p>Odor</p> <p>Odor threshold</p> <p>pH</p> <p>Relative evaporation rate (butyl acetate=1)</p> <p>Relative evaporation rate (ether=1)</p> <p>Melting point</p> <p>Freezing point</p> <p>Boiling point</p> <p>Flash point</p> <p>Critical temperature</p>	<p>: Gas</p> <p>: Colorless liquid.</p> <p>: 28 g/mol</p> <p>: Colorless liquid.</p> <p>: No odor warning properties.</p> <p>: No data available</p> <p>: Not applicable.</p> <p>: No data available</p> <p>: Not applicable.</p> <p>: -210 °C</p> <p>: No data available</p> <p>: -195.8 °C</p> <p>: No data available</p> <p>: -149.9 °C</p>



Nitrogen, refrigerated liquid

Safety Data Sheet P-4630

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.
 Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014

Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: Not applicable.
Critical pressure	: 3390 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: 0.8
Density	: 808.5 kg/m ³ Liquid density at boiling point and 1 atm
Relative gas density	: 0.97
Solubility	: Water: 20 mg/l
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: 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

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

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

None.

10.4. Conditions to avoid

Avoid high temperatures, exposure to Lithium (Li), Neodymium (Nd), Titanium (Ti), Magnesium.

10.5. Incompatible materials

None.



10.6. Hazardous decomposition products

Under certain conditions, nitrogen can react violently with lithium, neodymium, titanium (above 1472°F/800°C), and magnesium to form nitrides. At high temperature, it can also combine with oxygen and hydrogen.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity	: Not classified
Skin corrosion/irritation	: Not classified pH: Not applicable.
Serious eye damage/irritation	: Not classified pH: Not applicable.
Respiratory or skin sensitization	: Not classified
Germ cell mutagenicity	: Not classified
Carcinogenicity	: Not classified

 Nitrogen, refrigerated liquid Safety Data Sheet P-4630 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014	
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	
Nitrogen, refrigerated liquid (7727-37-9)	
Persistence and degradability	No ecological damage caused by this product.
12.3. Bioaccumulative potential	
Nitrogen, refrigerated liquid (7727-37-9)	
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.
12.4. Mobility in soil	
Nitrogen, refrigerated liquid (7727-37-9)	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.
12.5. Other adverse effects	
Other adverse effects	: Can cause frost damage to vegetation.
Effect on ozone layer	: None
Effect on the global warming	: No known effects from this product
SECTION 13: Disposal considerations	
13.1. Waste treatment methods	
Waste disposal recommendations	: Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.
SECTION 14: Transport information	
In accordance with DOT	
Transport document description	: UN1977 Nitrogen, refrigerated liquid (cryogenic liquid), 2.2
UN-No.(DOT)	: UN1977
Proper Shipping Name (DOT)	: Nitrogen, refrigerated liquid cryogenic liquid
Class (DOT)	: 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
Hazard labels (DOT)	: 2.2 - Non-flammable gas
	



Nitrogen, refrigerated liquid

Safety Data Sheet P-4630

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.

Date of issue: 01/01/1979 Revision date: 10/21/2016 Supersedes: 10/03/2014

SECTION 16: Other information

Other information

: When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc, P.O. Box 44, Tonawanda, NY 14151-0044)

PRAXAIR and the Flowing Airstream design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.

NFPA health hazard

: 3 - Short exposure could cause serious temporary or residual injury even though prompt medical attention was given.

NFPA fire hazard

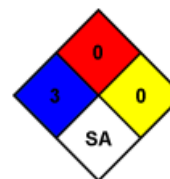
: 0 - Materials that will not burn.

NFPA reactivity

: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.

NFPA specific hazard

: SA - This denotes gases which are simple asphyxiants.



HMIS III Rating

Health

: 3 Serious Hazard - Major injury likely unless prompt action is taken and medical treatment is given

Flammability

: 0 Minimal Hazard



Physical


: 2 Moderate Hazard

SDS US (GHS HazCom 2012) - Praxair

This information is based on our current knowledge and is intended to describe the product for the purposes of health, safety and environmental requirements only. It should not therefore be construed as guaranteeing any specific property of the product.

B.4 Fitxa de Seguretat de l'Heli

		Helium, compressed Safety Data Sheet P-4602 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015
SECTION: 1. Product and company identification		
1.1. Product identifier		
Product form	:	Substance
Name	:	Helium, compressed
CAS No	:	7440-59-7
Formula	:	He
Other means of identification	:	Helium-4, refrigerant gas R-704, LaserStar Helium, Medipure Helium, UltraLift Helium, Helium - Diving Grade
1.2. Relevant identified uses of the substance or mixture and uses advised against		
Use of the substance/mixture	:	Industrial use Medical applications Diving Gas (Underwater Breathing)
1.3. Details of the supplier of the safety data sheet		
		Praxair, Inc. 10 Riverview Drive Danbury, CT 06810-6268 - USA T 1-800-772-9247 (1-800-PRAXAIR) - F 1-716-879-2146 www.praxair.com
1.4. Emergency telephone number		
Emergency number	:	Onsite Emergency: 1-800-645-4633 CHEMTREC, 24hr/day 7days/week — Within USA: 1-800-424-9300, Outside USA: 001-703-527-3887 (collect calls accepted, Contract 17729)
SECTION 2: Hazard identification		
2.1. Classification of the substance or mixture		
GHS-US classification Compressed gas H280		
2.2. Label elements		
GHS-US labeling		
Hazard pictograms (GHS-US)	:	 GHS04
Signal word (GHS-US)	:	WARNING
Hazard statements (GHS-US)	:	H280 - CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED OSHA-H01 - MAY DISPLACE OXYGEN AND CAUSE RAPID SUFFOCATION
Precautionary statements (GHS-US)	:	P202 - Do not handle until all safety precautions have been read and understood P271 - Use and store only outdoors or in a well-ventilated area P403 - Use and store only outdoors or in a well-ventilated place CGA-PG05 - Use a back flow preventive device in the piping CGA-PG10 - Use only with equipment rated for cylinder pressure CGA-PG06 - Close valve after each use and when empty CGA-PG02 - Protect from sunlight when ambient temperature exceeds 52°C (125°F)
2.3. Other hazards		
Other hazards not contributing to the	:	Asphyxiant in high concentrations.
EN (English US)		SDS ID: P-4602 1/8



Helium, compressed

Safety Data Sheet P-4602

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.
Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015

classification

2.4. Unknown acute toxicity (GHS US)
No data available

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name : Helium, compressed
CAS No : 7440-59-7

Name	Product identifier	%
Helium	(CAS No) 7440-59-7	99.5 - 100

3.2. Mixture
Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures after inhalation : Remove to fresh air and keep at rest in a position comfortable for breathing. If not breathing, give artificial respiration. If breathing is difficult, trained personnel should give oxygen. Call a physician.

First-aid measures after skin contact : Adverse effects not expected from this product.

First-aid measures after eye contact : Adverse effects not expected from this product. In case of eye irritation: Rinse immediately with plenty of water. Consult an ophthalmologist if irritation persists.

First-aid measures after ingestion : Ingestion is not considered a potential route of exposure.

4.2. Most important symptoms and effects, both acute and delayed
No additional information available

4.3. Indication of any immediate medical attention and special treatment needed
None.

SECTION 5: Firefighting measures

5.1. Extinguishing media
Suitable extinguishing media : Use extinguishing media appropriate for surrounding fire.

5.2. Special hazards arising from the substance or mixture
No additional information available

5.3. Advice for firefighters

Firefighting instructions : Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with OSHA 29 CFR 1910.156 and applicable standards under 29 CFR 1910 Subpart L—Fire Protection.

Protection during firefighting : Compressed gas: asphyxiant. Suffocation hazard by lack of oxygen.

Special protective equipment for fire fighters : Use self-contained breathing apparatus. Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.

Specific methods : Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems


Stop flow of product if safe to do so


Use water spray or fog to knock down fire fumes if possible.


SECTION 6: Accidental release measures



6.1. Personal precautions, protective equipment and emergency procedures


General measures : Evacuate area. Ensure adequate air ventilation. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Stop leak if safe to do so.


 Helium, compressed Safety Data Sheet P-4602 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015													
6.1.1. For non-emergency personnel	No additional information available												
6.1.2. For emergency responders	No additional information available												
6.2. Environmental precautions	Try to stop release.												
6.3. Methods and material for containment and cleaning up	No additional information available												
6.4. Reference to other sections	See also sections 8 and 13.												
SECTION 7: Handling and storage													
7.1. Precautions for safe handling	<p>Precautions for safe handling : Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.</p> <p>Safe use of the product : The suitability of this product as a component in underwater breathing gas mixtures is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the physiological effects, methods employed, frequency and duration of use, hazards, side effects, and precautions to be taken.</p>												
7.2. Conditions for safe storage, including any incompatibilities	<p>Storage conditions : Store in a cool, well-ventilated place. Store and use with adequate ventilation. Store only where temperature will not exceed 125°F (52°C). Firmly secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods</p> <p>OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Gases can cause rapid suffocation because of oxygen deficiency; store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.</p>												
7.3. Specific end use(s)	None.												
SECTION 8: Exposure controls/personal protection													
8.1. Control parameters	<table border="1"> <thead> <tr> <th colspan="2">Helium, compressed (7440-59-7)</th> </tr> </thead> <tbody> <tr> <td>ACGIH</td> <td>Not established</td> </tr> <tr> <td>USA OSHA</td> <td>Not established</td> </tr> <tr> <th colspan="2">Helium (7440-59-7)</th> </tr> <tr> <td>ACGIH</td> <td>Not established</td> </tr> <tr> <td>USA OSHA</td> <td>Not established</td> </tr> </tbody> </table>	Helium, compressed (7440-59-7)		ACGIH	Not established	USA OSHA	Not established	Helium (7440-59-7)		ACGIH	Not established	USA OSHA	Not established
Helium, compressed (7440-59-7)													
ACGIH	Not established												
USA OSHA	Not established												
Helium (7440-59-7)													
ACGIH	Not established												
USA OSHA	Not established												

 Helium, compressed Safety Data Sheet P-4602 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015	
8.2. Exposure controls	
Appropriate engineering controls	: Use a local exhaust system with sufficient flow velocity to maintain an adequate supply of air in the worker's breathing zone. Mechanical (general): General exhaust ventilation may be acceptable if it can maintain an adequate supply of air.
Eye protection	: Wear safety glasses with side shields.
Skin and body protection	: Wear metatarsal shoes and work gloves for cylinder handling, and protective clothing where needed. Wear appropriate chemical gloves during cylinder changeout or wherever contact with product is possible. Select per OSHA 29 CFR 1910.132, 1910.136, and 1910.138.
Respiratory protection	: When workplace conditions warrant respirator use, follow a respiratory protection program that meets OSHA 29 CFR 1910.134, ANSI Z88.2, or MSHA 30 CFR 72.710 (where applicable). Use an air-supplied or air-purifying cartridge if the action level is exceeded. Ensure that the respirator has the appropriate protection factor for the exposure level. If cartridge type respirators are used, the cartridge must be appropriate for the chemical exposure. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
SECTION 9: Physical and chemical properties	
9.1. Information on basic physical and chemical properties	
Physical state	: Gas
Appearance	: Colorless gas.
Molecular mass	: 4 g/mol
Color	: Colorless.
Odor	: Odorless.
Odor threshold	: No data available
pH	: Not applicable.
Relative evaporation rate (butyl acetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: -272 °C
Freezing point	: No data available
Boiling point	: -268.93 °C
Flash point	: No data available
Critical temperature	: -268 °C
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Flammability (solid, gas)	: No data available
Vapor pressure	: Not applicable.
Critical pressure	: 230 kPa
Relative vapor density at 20 °C	: No data available
Relative density	: No data available
Density	: 0.166 kg/m³
Relative gas density	: 0.14
Solubility	: Water: 1.5 mg/l
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Explosive properties	: Not applicable.
Oxidizing properties	: None.
Explosion limits	: No data available
9.2. Other information	
Gas group	: Compressed gas
Additional information	: None

 Helium, compressed Safety Data Sheet P-4602 <small>This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015</small>	
SECTION 10: Stability and reactivity	
10.1. Reactivity	No additional information available
10.2. Chemical stability	Stable under normal conditions.
10.3. Possibility of hazardous reactions	None.
10.4. Conditions to avoid	None under recommended storage and handling conditions (see section 7).
10.5. Incompatible materials	None.
10.6. Hazardous decomposition products	None.
SECTION 11: Toxicological information	
11.1. Information on toxicological effects	
Acute toxicity	: Not classified
Skin corrosion/irritation	: Not classified pH: Not applicable.
Serious eye damage/irritation	: Not classified pH: Not applicable.
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	
Helium, compressed (7440-59-7)	
Persistence and degradability	No ecological damage caused by this product.
Helium (7440-59-7)	
Persistence and degradability	No ecological damage caused by this product.
12.3. Bioaccumulative potential	
Helium, compressed (7440-59-7)	
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.
Helium (7440-59-7)	
Log Pow	Not applicable for inorganic gases.
Log Kow	Not applicable.

 Helium, compressed Safety Data Sheet P-4602 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015	
Helium (7440-59-7)	
Bioaccumulative potential	No ecological damage caused by this product.
12.4. Mobility in soil	
Helium, compressed (7440-59-7)	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.
Helium (7440-59-7)	
Mobility in soil	No data available.
Ecology - soil	No ecological damage caused by this product.
12.5. Other adverse effects	
Effect on ozone layer	: None
Effect on the global warming	: None
SECTION 13: Disposal considerations	
13.1. Waste treatment methods	
Waste disposal recommendations	: Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.
SECTION 14: Transport information	
In accordance with DOT	
Transport document description	: UN1046 Helium, compressed, 2.2
UN-No.(DOT)	: UN1046
Proper Shipping Name (DOT)	: Helium, compressed
Class (DOT)	: 2.2 - Class 2.2 - Non-flammable compressed gas 49 CFR 173.115
Hazard labels (DOT)	: 2.2 - Non-flammable gas
	
Additional information	
Emergency Response Guide (ERG) Number	: 120 (UN1963);121 (UN1046)
Other information	: No supplementary information available.
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.
Transport by sea	
UN-No. (IMDG)	: 1046
Proper Shipping Name (IMDG)	: HELIUM, COMPRESSED
Class (IMDG)	: 2 - Gases
MFAG-No	: 121
Air transport	
UN-No. (IATA)	: 1046
Proper Shipping Name (IATA)	: Helium, compressed
Class (IATA)	: 2
Civil Aeronautics Law	: Gases under pressure/Gases nonflammable nontoxic under pressure

 Helium, compressed Safety Data Sheet P-4602 This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication. Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015				
SECTION 15: Regulatory information				
15.1. US Federal regulations				
Helium, compressed (7440-59-7)				
Listed on the United States TSCA (Toxic Substances Control Act) inventory				
SARA Section 311/312 Hazard Classes	Sudden release of pressure hazard			
All components of this product are listed on the Toxic Substances Control Act (TSCA) inventory.				
This product or mixture does not contain a toxic chemical or chemicals in excess of the applicable de minimis concentration as specified in 40 CFR §372.38(a) subject to the reporting requirements of section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.				
15.2. International regulations				
CANADA				
Helium, compressed (7440-59-7)				
Listed on the Canadian DSL (Domestic Substances List)				
Helium (7440-59-7)				
Listed on the Canadian DSL (Domestic Substances List)				
EU-Regulations				
Helium, compressed (7440-59-7)				
Listed on the EEC inventory EINECS (European Inventory of Existing Commercial Chemical Substances)				
15.2.2. National regulations				
Helium, compressed (7440-59-7)				
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 Korean ECL (Existing Chemicals List)				
Listed on NZIoC (New Zealand Inventory of Chemicals)				
Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances)				
Listed on INSQ (Mexican National Inventory of Chemical Substances)				
15.3. US State regulations				
Helium, compressed(7440-59-7)				
U.S. - California - Proposition 65 - Carcinogens List	No			
U.S. - California - Proposition 65 - Developmental Toxicity	No			
U.S. - California - Proposition 65 - Reproductive Toxicity - Female	No			
U.S. - California - Proposition 65 - Reproductive Toxicity - Male	No			
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) List			
California Proposition 65 - This product does not contain any substances known to the state of California to cause cancer, developmental and/or reproductive harm				
Helium (7440-59-7)				
U.S. - California - Proposition 65 - Carcinogens List	U.S. - California - Proposition 65 - Developmental Toxicity	U.S. - California - Proposition 65 - Reproductive Toxicity - Female	U.S. - California - Proposition 65 - Reproductive Toxicity - Male	Non-significant risk level (NSRL)



Helium, compressed

Safety Data Sheet P-4602

This SDS conforms to U.S. Code of Federal Regulations 29 CFR 1910.1200, Hazard Communication.
Date of issue: 01/01/1979 Revision date: 10/17/2016 Supersedes: 06/23/2015

Helium (7440-59-7)				
No	No	No	No	

U.S. - Massachusetts - Right To Know List
U.S. - New Jersey - Right to Know Hazardous Substance List
U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

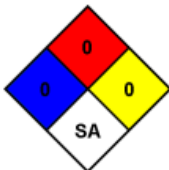
Other information : When you mix two or more chemicals, you can create additional, unexpected hazards. Obtain and evaluate the safety information for each component before you produce the mixture. Consult an industrial hygienist or other trained person when you evaluate the end product. Before using any plastics, confirm their compatibility with this product

Praxair asks users of this product to study this SDS and become aware of the product hazards and safety information. To promote safe use of this product, a user should (1) notify employees, agents, and contractors of the information in this SDS and of any other known product hazards and safety information, (2) furnish this information to each purchaser of the product, and (3) ask each purchaser to notify its employees and customers of the product hazards and safety information

The opinions expressed herein are those of qualified experts within Praxair, Inc. We believe that the information contained herein is current as of the date of this Safety Data Sheet. Since the use of this information and the conditions of use are not within the control of Praxair, Inc, it is the user's obligation to determine the conditions of safe use of the product

Praxair SDSs are furnished on sale or delivery by Praxair or the independent distributors and suppliers who package and sell our products. To obtain current SDSs for these products, contact your Praxair sales representative, local distributor, or supplier, or download from www.praxair.com. If you have questions regarding Praxair SDSs, would like the document number and date of the latest SDS, or would like the names of the Praxair suppliers in your area, phone or write the Praxair Call Center (Phone: 1-800-PRAXAIR/1-800-772-9247; Address: Praxair Call Center, Praxair, Inc, P.O. Box 44, Tonawanda, NY 14151-0044)

PRAXAIR and the Flowing Airstream design are trademarks or registered trademarks of Praxair Technology, Inc. in the United States and/or other countries.




<p>NFPA health hazard</p> <p>NFPA fire hazard</p> <p>NFPA reactivity</p> <p>NFPA specific hazard</p>	<p>: 0 - Exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials.</p> <p>: 0 - Materials that will not burn.</p> <p>: 0 - Normally stable, even under fire exposure conditions, and are not reactive with water.</p> <p>: SA - This denotes gases which are simple asphyxiants.</p>	
--	--	--


HMIS III Rating


Health	: 0 Minimal Hazard - No significant risk to health
Flammability	: 0 Minimal Hazard
Physical	: 3 Serious Hazard



SDS US (GHS HazCom 2012) - Praxair


B.5 Fitxa de Seguretat del Oxigen


 Oxygen Safety Data Sheet E-4638 <small>according to the Hazardous Products Regulation (February 11, 2015)</small> <small>Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013</small>	
SECTION 1: Identification	
1.1. Product Identifier	
Product form	: Substance
Name	: Oxygen
CAS No	: 7782-44-7
Formula	: O ₂
Other means of identification	: Oxygen, Compressed; Medipure® Oxygen; Aviator's Breathing Oxygen; USP Oxygen; Oxygen - Diving Grade; Dioxygen
Product group	: Core Products
1.2. Recommended use and restrictions on use	
Recommended uses and restrictions	: Medical applications Industrial use Diving Gas (Underwater Breathing)
1.3. Supplier	
Praxair Canada inc. 1200 – 1 City Centre Drive Mississauga - Canada L5B 1M2 T 1-905-803-1600 - F 1-905-803-1682 www.praxair.ca	
1.4. Emergency telephone number	
Emergency number	: 1-800-363-0042 Call emergency number 24 hours a day only for spills, leaks, fire, exposure, or accidents involving this product. For routine information, contact your supplier or Praxair sales representative.
SECTION 2: Hazard identification	
2.1. Classification of the substance or mixture	
GHS-CA classification	
Ox. Gas 1	H270
Compressed gas	H280
2.2. GHS Label elements, including precautionary statements	
GHS-CA labelling	
Hazard pictograms	:   GHS03 GHS04
Signal word	: DANGER
Hazard statements	: MAY CAUSE OR INTENSIFY FIRE; OXIDIZER CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED
Precautionary statements	: Do not handle until all safety precautions have been read and understood Keep away from clothing and other combustible materials Keep valves and fittings free from oil and grease In case of fire: Stop leak if safe to do so Use and store only outdoors or in a well-ventilated area Protect from sunlight when ambient temperature exceeds 52°C (125°F) Use a back flow preventive device in the piping Use only with equipment of compatible materials of construction and rated for cylinder pressure

 <h1>Oxygen</h1> <h2>Safety Data Sheet E-4638</h2> <p>according to the Hazardous Products Regulation (February 11, 2015) Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013</p>									
DO NOT change or force fit connections Avoid spills. Do not walk on or roll equipment over spills Use only with equipment cleaned for oxygen service Open valve slowly Close valve after each use and when empty									
2.3. Other hazards Other hazards not contributing to the classification : Breathing 80 percent or more oxygen at atmospheric pressure for more than a few hours may cause nasal stuffiness, cough, sore throat, chest pain, and breathing difficulty. Breathing oxygen at higher pressure increases the likelihood of adverse effects within a shorter time period. Breathing pure oxygen under pressure may cause lung damage and central nervous system (CNS) effects, resulting in dizziness, poor coordination, tingling sensation, visual and hearing disturbances, muscular twitching, unconsciousness, and convulsions. Breathing oxygen under pressure may cause prolongation of adaptation to darkness and reduced peripheral vision.									
2.4. Unknown acute toxicity (GHS-CA) No data available									
SECTION 3: Composition/information on ingredients									
3.1. Substances									
<table border="1"> <thead> <tr> <th>Name</th> <th>CAS No.</th> <th>% (Vol.)</th> <th>Common Name (synonyms)</th> </tr> </thead> <tbody> <tr> <td>Oxygen (Main constituent)</td> <td>(CAS No) 7782-44-7</td> <td>> 99.5</td> <td></td> </tr> </tbody> </table>	Name	CAS No.	% (Vol.)	Common Name (synonyms)	Oxygen (Main constituent)	(CAS No) 7782-44-7	> 99.5		
Name	CAS No.	% (Vol.)	Common Name (synonyms)						
Oxygen (Main constituent)	(CAS No) 7782-44-7	> 99.5							
3.2. Mixtures Not applicable									
SECTION 4: First-aid measures									
4.1. Description of first aid measures									
First-aid measures after inhalation	: Get medical advice/attention. Remove to fresh air and keep at rest in a position comfortable for breathing.								
First-aid measures after skin contact	: Adverse effects not expected from this product.								
First-aid measures after eye contact	: In case of eye irritation: Rinse immediately with plenty of water. Consult an ophthalmologist if irritation persists.								
First-aid measures after ingestion	: Ingestion is not considered a potential route of exposure.								
4.2. Most important symptoms and effects (acute and delayed) No additional information available									
4.3. Immediate medical attention and special treatment, if necessary									
Other medical advice or treatment	: None.								
SECTION 5: Fire-fighting measures									
5.1. Suitable extinguishing media									
Suitable extinguishing media	: Vigorously accelerates combustion. Use media appropriate for surrounding fire. Water (e.g. safety shower) is the preferred extinguishing media for clothing fires.								
5.2. Unsuitable extinguishing media No additional information available									
5.3. Specific hazards arising from the hazardous product									
Fire hazard	: Oxidizing agent; vigorously accelerates combustion. Contact with flammable materials may cause fire or explosion.								
Explosion hazard	: CONTAINS GAS UNDER PRESSURE; MAY EXPLODE IF HEATED.								
Reactivity	: No additional information available.								
Reactivity in case of fire	: No reactivity hazard other than the effects described in sub-sections below.								

 Oxygen Safety Data Sheet E-4638 <small>according to the Hazardous Products Regulation (February 11, 2015)</small> <small>Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013</small>	
5.4. Special protective equipment and precautions for fire-fighters	
Firefighting instructions	: High-pressure, oxidizing gas Evacuate all personnel from the danger area. Use self-contained breathing apparatus (SCBA) and protective clothing. Immediately cool containers with water from maximum distance. Stop flow of gas if safe to do so, while continuing cooling water spray. Remove ignition sources if safe to do so. Remove containers from area of fire if safe to do so. On-site fire brigades must comply with their provincial and local fire code regulations.
Protection during firefighting	: Self-contained breathing apparatus.
Special protective equipment for fire fighters	: Standard protective clothing and equipment (Self Contained Breathing Apparatus) for fire fighters.
Specific methods	: Use fire control measures appropriate for the surrounding fire. Exposure to fire and heat radiation may cause gas containers to rupture. Cool endangered containers with water spray jet from a protected position. Prevent water used in emergency cases from entering sewers and drainage systems Stop flow of product if safe to do so
Other information	: Use water spray or fog to knock down fire fumes if possible. Heat of fire can build pressure in container and cause it to rupture. Cylinders are equipped with a pressure relief device. (Exceptions may exist where authorized by TC.) No part of the container should be subjected to a temperature higher than 125°F (52°C). Smoking, flames, and electric sparks in the presence of enriched oxygen atmospheres are potential explosion hazards.
SECTION 6: Accidental release measures	
6.1. Personal precautions, protective equipment and emergency procedures	
General measures	: Prevent from entering sewers, basements and workpits, or any place where its accumulation can be dangerous. Ensure adequate air ventilation. Eliminate ignition sources. Evacuate area. Try to stop release. Monitor concentration of released product. Wear self-contained breathing apparatus when entering area unless atmosphere is proven to be safe. Stop leak if safe to do so.
6.2. Methods and materials for containment and cleaning up	
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	: Wear leather safety gloves and safety shoes when handling cylinders. Protect cylinders from physical damage; do not drag, roll, slide or drop. While moving cylinder, always keep in place removable valve cover. Never attempt to lift a cylinder by its cap; the cap is intended solely to protect the valve. When moving cylinders, even for short distances, use a cart (trolley, hand truck, etc.) designed to transport cylinders. Never insert an object (e.g. wrench, screwdriver, pry bar) into cap openings; doing so may damage the valve and cause a leak. Use an adjustable strap wrench to remove over-tight or rusted caps. Slowly open the valve. If the valve is hard to open, discontinue use and contact your supplier. Close the container valve after each use; keep closed even when empty. Never apply flame or localized heat directly to any part of the container. High temperatures may damage the container and could cause the pressure relief device to fail prematurely, venting the container contents. For other precautions in using this product, see section 16.
Safe use of the product	: The suitability of this product as a component in underwater breathing gas mixtures is to be determined by or under the supervision of personnel experienced in the use of underwater breathing gas mixtures and familiar with the physiological effects, methods employed, frequency and duration of use, hazards, side effects, and precautions to be taken.

 <h1>Oxygen</h1> <h2>Safety Data Sheet E-4638</h2> <p>according to the Hazardous Products Regulation (February 11, 2015) Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013</p>	
<h3>7.2. Conditions for safe storage, including any incompatibilities</h3>	
Storage conditions	: Store only where temperature will not exceed 125°F (52°C). Post "No Smoking" or "Open Flames" signs in storage and use areas. There must be no sources of ignition. Separate packages and protect against potential fire and/or explosion damage following appropriate codes and requirements (e.g. NFPA 30, NFPA 55, NFPA 70, and/or NFPA 221 in the U.S.) or according to requirements determined by the Authority Having Jurisdiction (AHJ). Always secure containers upright to keep them from falling or being knocked over. Install valve protection cap, if provided, firmly in place by hand when the container is not in use. Store full and empty containers separately. Use a first-in, first-out inventory system to prevent storing full containers for long periods. For other precautions in using this product, see section 16 OTHER PRECAUTIONS FOR HANDLING, STORAGE, AND USE: When handling product under pressure, use piping and equipment adequately designed to withstand the pressures to be encountered. Never work on a pressurized system. Use a back flow preventive device in the piping. Store and use with adequate ventilation. If a leak occurs, close the container valve and blow down the system in a safe and environmentally correct manner in compliance with all international, federal/national, state/provincial, and local laws; then repair the leak. Never place a container where it may become part of an electrical circuit.
<h2>SECTION 8: Exposure controls/personal protection</h2>	
<h3>8.1. Control parameters</h3> <p>No additional information available</p>	
<h3>8.2. Appropriate engineering controls</h3>	
Appropriate engineering controls	: Avoid oxygen rich (>23,5%) atmospheres. Use a local exhaust system with sufficient flow velocity to maintain an adequate supply of air in the worker's breathing zone. Mechanical (general): General exhaust ventilation may be acceptable if it can maintain an adequate supply of air.
<h3>8.3. Individual protection measures/Personal protective equipment</h3>	
Personal protective equipment	: Safety glasses. Face shield. Gloves. <div style="text-align: center;">  </div>
Hand protection	: Wear work gloves when handling containers. Wear heavy rubber gloves where contact with product may occur.
Eye protection	: Wear goggles when transfilling or breaking transfer connections. Select in accordance with the current CSA standard Z94.3, "Industrial Eye and Face Protection", and any provincial regulations, local bylaws or guidelines.
Respiratory protection	: Respiratory protection: Use respirable fume respirator or air supplied respirator when working in confined space or where local exhaust or ventilation does not keep exposure below TLV. Select in accordance with provincial regulations, local bylaws or guidelines. Selection should be based on the current CSA standard Z94.4, "Selection, Care, and Use of Respirators." Respirators should also be approved by NIOSH and MSHA. For emergencies or instances with unknown exposure levels, use a self-contained breathing apparatus (SCBA).
Environmental exposure controls	: Environmental exposure controls: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.
Other information	: Other protection : Safety shoes for general handling at customer sites. Metatarsal shoes and cuffless trousers for cylinder handling at packaging and filling plants. Select in accordance with the current CSA standard Z195, "Protective Foot Wear", and any provincial regulations, local bylaws or guidelines. For working with flammable and oxidizing materials, consider the use of flame resistant anti-static safety clothing.
<h2>SECTION 9: Physical and chemical properties</h2>	
<h3>9.1. Information on basic physical and chemical properties</h3>	
Physical state	: Gas
Appearance	: Colourless gas.
Molecular mass	: 32 g/mol

 Oxygen Safety Data Sheet E-4638 according to the Hazardous Products Regulation (February 11, 2015) Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013	
Colour	: Colourless.
Odour	: No odour warning properties.
Odour threshold	: No data available
pH	: Not applicable.
pH solution	: No data available
Relative evaporation rate (butylacetate=1)	: No data available
Relative evaporation rate (ether=1)	: Not applicable.
Melting point	: >= -219 °C (-362°F)
Freezing point	: No data available
Boiling point	: -183 °C (-297°F)
Flash point	: Not applicable.
Critical temperature	: -118.6 °C (-181.48°F)
Auto-ignition temperature	: Not applicable.
Decomposition temperature	: No data available
Vapour pressure	: Not applicable.
Vapour pressure at 50 °C	: No data available
Critical pressure	: 50.4 bar (731.4 psia)
Relative vapour density at 20 °C	: 0.0827 lb/ft3 (1.325 kg/m3) absolute vapour density at 70°F/21.1°C, 1 atm
Relative density	: 1.1
Relative density of saturated gas/air mixture	: No data available
Density	: 1.4289 kg/m ³ (at 21.1 °C)
Relative gas density	: 1.1
Solubility	: Water: 39 mg/l
Log Pow	: Not applicable.
Log Kow	: Not applicable.
Viscosity, kinematic	: Not applicable.
Viscosity, dynamic	: Not applicable.
Viscosity, kinematic (calculated value) (40 °C)	: No data available
Explosive properties	: Not applicable.
Oxidizing properties	: Oxidizer.
Flammability (solid, gas)	: Non flammable Non flammable
9.2. Other information	
Gas group	: Compressed gas
Additional information	: Gas/vapour heavier than air. May accumulate in confined spaces, particularly at or below ground level
SECTION 10: Stability and reactivity	
10.1. Reactivity	
Reactivity	: No additional information available.
Chemical stability	: Stable under normal conditions.
Possibility of hazardous reactions	: Violently oxidizes organic material.
Conditions to avoid	: None under recommended storage and handling conditions (see section 7).
Incompatible materials	: Keep equipment free from oil and grease. 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. May react violently with combustible materials. May react violently with reducing agents.
Hazardous decomposition products	: None.
SECTION 11: Toxicological information	

 Oxygen Safety Data Sheet E-4638 <small>according to the Hazardous Products Regulation (February 11, 2015)</small> <small>Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013</small>	
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 pH: Not applicable.
Serious eye damage/irritation	: Not classified pH: Not applicable.
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 (7782-44-7)	
Persistence and degradability	No ecological damage caused by this product.
12.3. Bioaccumulative potential	
Oxygen (7782-44-7)	
Log Pow	Not applicable.
Log Kow	Not applicable.
Bioaccumulative potential	No ecological damage caused by this product.
12.4. Mobility in soil	
Oxygen (7782-44-7)	
Mobility in soil	No data available.
Log Pow	Not applicable.
Log Kow	Not applicable.
Ecology - soil	No ecological damage caused by this product.
12.5. Other adverse effects	
Effect on the ozone layer	: None
Effect on global warming	: No known effects from this product
SECTION 13: Disposal considerations	
13.1. Disposal methods	
Waste disposal recommendations	: Dispose of contents/container in accordance with local/regional/national/international regulations. Contact supplier for any special requirements.
SECTION 14: Transport information	

 Oxygen Safety Data Sheet E-4638 according to the Hazardous Products Regulation (February 11, 2015) Date of issue: 10-15-1979 Revision date: 08-03-2016 Supersedes: 10-15-2013	
14.1. Basic shipping description	
In accordance with TDG	
TDG	
UN-No. (TDG)	: UN1072
TDG Primary Hazard Classes	: 2.2 - Class 2.2 - Non-Flammable, Non-Toxic Gas.
TDG Subsidiary Classes	: 5.1
Proper shipping name	: OXYGEN, COMPRESSED
ERAP Index	: 3 000
Explosive Limit and Limited Quantity Index	: 0.125 L (0,125 L)
Passenger Carrying Road Vehicle or Passenger Carrying Railway Vehicle Index	: 75 L
14.3. Air and sea transport	
IMDG	
UN-No. (IMDG)	: 1072
Proper Shipping Name (IMDG)	: OXYGEN, COMPRESSED
Class (IMDG)	: 2 - Gases
MFAG-No	: 122
IATA	
UN-No. (IATA)	: 1072
Proper Shipping Name (IATA)	: Oxygen, compressed
Class (IATA)	: 2
SECTION 15: Regulatory information	
15.1. National regulations	
Oxygen (7782-44-7)	
Listed on the Canadian DSL (Domestic Substances List)	
15.2. International regulations	
Oxygen (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 the Korean ECL (Existing Chemicals List)	
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)	
SECTION 16: Other information	
Date of issue	: 15/10/1979
Revision date	: 03/08/2016
Supersedes	: 15/10/2013
Indication of changes:	
Training advice	: Ensure operators understand the hazard of oxygen enrichment

