



# MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI, Canadian WHMIS Standards and EC Standards

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** Less than 1% FLUORINE IN ARGON, HELIUM, KRYPTON, NEON and/or XENON

**PRODUCT USE:** In Excimer Lasers

**MANUFACTURER:**

**ADDRESS:** SPECTRA GASES, INC.  
3434 Route 22 West  
Branchburg, NJ 08876, U.S.A.

**PHONE:** 908/252-9300

**FAX:** 908/252-0811

**WEB SITE:** [www.spectra-gases.com](http://www.spectra-gases.com)

**SPECTRA GASES EMERGENCY CONTACT:** 800/932-0624 8:30 am - 7:00 pm (EST)

**24 HOUR EMERGENCY CONTACT, CHEMTREC:** 800/424-9300, 202/484-7616

## SECTION 2. COMPOSITION and INFORMATION ON INGREDIENTS

Chemical Name	Chemical Synonym	Chemical Formula	CAS #	EINECS #	% Composition in Mixture	OSHA PEL	ACGIH TLV	NIOSH REL
Fluorine	NA	F <sub>2</sub>	7782-41-4	231-954-8	< 1%	TWA = 0.1ppm	TWA = 1ppm STEL = 2 ppm	TWA = 0.1 ppm IDLH = 25 ppm
Krypton*	NA	Kr	7439-90-9	231-098-5	0-20%	NA	NA	NA
Xenon*	NA	Xe	7440-63-3	231-172-7	0-20%	NA	NA	NA
Argon*	NA	Ar	7440-37-1	231-147-0	0-99%	NA	NA	NA
Helium*	NA	He	7440-59-7	231-168-5	0-99%	NA	NA	NA
Neon*	NA	Ne	7440-01-9	231-110-9	0-99%	NA	NA	NA

\* There are no established exposure levels for these components. They are simple asphyxiants.

## SECTION 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** This gas is a colorless, non-flammable, gas mixture, shipped under pressure. This gas mixture *may cause adverse health effects* due to its Fluorine content, which can reach exposure limits at the percentage in this mixture. Pure Fluorine is a powerful caustic irritant to all tissues: *while the dilute concentration (<1%) of Fluorine in this mixture significantly reduces exposure risk*, releases of this product should be responded to with caution. Fluorine has a pungent odor and a low odor threshold; the odor of this product provides a good warning of a release of this gas mixture. **WARNING** - If rescue personnel need to enter an area suspected of having a toxic level of Fluorine (a component of this gas mixture), they should be equipped with Self-Contained Breathing Apparatus (SCBA).

**HMIS RATINGS:** HEALTH HAZARD: = 1; FLAMMABILITY HAZARD: = 0; PHYSICAL HAZARD: = 1

### ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE:

**EYE CONTACT:** Can cause tearing and irritation, swelling and/or redness as Fluorine is a lachrymator. Severe over-exposure to the eyes can cause burns if contact is prolonged.

**INGESTION:** Not a likely route of industrial exposure.

**INHALATION:** Can cause significant, adverse effects, due to the presence of Fluorine, which is extremely toxic. Minor inhalation exposure of this gas mixture may cause irritation to the lungs, nose, throat and mucous membranes, resulting in coughing and breathing difficulty. Prolonged or severe inhalation overexposures may cause tissue damage and pulmonary edema (an accumulation of fluid in the lungs), a potentially fatal condition.

**SKIN CONTACT:** Can cause mild to moderate irritation, depending on the duration of exposure, due to the presence of Fluorine.

**OTHER HEALTH EFFECTS:** Other health effects may be related to the hazards of compressed gases. Frostbite may result from contact with rapidly expanding gases that are released from under high pressure.

Symptoms of frostbite include change in skin color to white or grayish-yellow. A sudden, uncontrolled release of pressurized gas may cause mechanical injury.

### SECTION 3. HAZARD IDENTIFICATION (Continued)

#### ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE:

**ROUTE OF ENTRY:** Inhalation

**TARGET ORGANS:** Respiratory System

**SYMPTOMS:** Persistent irritation may result from repeated exposure. Repeated over-exposure to a corrosive gas mixture can result in emphysema. However, at the concentration level of fluorine in this mix, the gas is not classified as corrosive. Repeated over-exposure to low levels of fluorine for extended periods of time (i.e. years or decades) may lead to fluorosis which is a weakening and degeneration of bone structure.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Unknown

**CARCINOGENICITY:** The components of this gas mixture are not listed as carcinogens or as potential carcinogens on OSHA, NTP, IARC, or CAL/OSHA Carcinogenicity lists.

### SECTION 4. FIRST AID MEASURES

**EYE CONTACT:** In case of contact, gently flush victim's eyes with water for minimum of 15 minutes. Administer anesthetic eye drops after one minute of flushing if victim suffers from spasms to the eyes, in order to facilitate irrigation.

**INGESTION:** Not a likely route of exposure for this gas.

**INHALATION:** Remove victim(s) to fresh air, as quickly as possible. Trained personnel should administer supplemental oxygen and/or cardio-pulmonary resuscitation, if necessary. For severe, immediate effects or delayed symptoms seek appropriate medical attention.

**SKIN CONTACT:** In case of skin contact, immediately flush area of exposure with water for minimum of 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Exposure to this mix is highly unlikely to result in any tissue damage due to HF. However, calcium gluconate gel can be applied to affected areas to bind un-reacted HF and prevent tissue damage. Victim should seek appropriate medical attention if symptoms persist. Treat any symptoms of frostbite by gently warming affected area. DO NOT USE HOT WATER.

### SECTION 5. FIRE FIGHTING MEASURES

**FLASH POINT:** Not Applicable

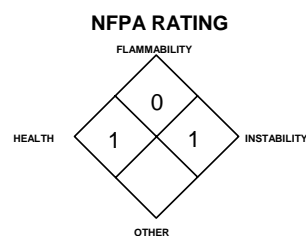
**AUTOIGNITION:** Not Applicable

**FLAMMABLE RANGE:** Not Applicable

**NFPA RATINGS:**

HEALTH: = 1      FLAMMABILITY: = 0

INSTABILITY: = 1      SPECIAL: None



**EXTINGUISHING MEDIA:** This is a non-flammable gas mixture; use fire-extinguishing media appropriate for the surrounding materials.

**SPECIAL FIRE-FIGHTING PROCEDURES:** Water should be used in a fire emergency to keep cylinders cool, if they cannot be removed from the fire area.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** Cylinders containing Fluorine as a component may not have a pressure relief device. Exposure to high heat, as in a fire situation, can cause the cylinder to rupture. Due to the low concentration level of Fluorine in this mixture, conversion to sufficient Hydrofluoric Acid to warrant concern about acidity of fire-water and disposal issues is unlikely.

**EXPLOSION SENSITIVITY TO MECHANICAL IMPACT:** Not sensitive.

**EXPLOSION SENSITIVITY TO STATIC DISCHARGE:** Not sensitive.

**HAZARDOUS COMBUSTION PRODUCTS:** The Fluorine component of this gas mixture will produce toxic combustion products including hydrogen fluoride and oxygen difluoride.

### SECTION 6. ACCIDENTAL RELEASE MEASURES

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:** In the event of a leak, operator should close the gas source if possible to do so safely. Evacuate immediate area. Only trained personnel, wearing Self-Contained Breathing Apparatus (SCBA) and a chemically resistant suit should re-enter a contaminated area. A severe hazard of mechanical injury may exist due to valve failure or rapid release of cylinder contents.

If leak is in user's gas handling equipment or system, close cylinder valve, safely vent high pressure and purge with inert gas. Purge gas should be near atmospheric pressure before attempting repairs. If leak is from the cylinder, cylinder valve or the valve pressure relief device (PRD), contact your supplier.

Levels of Fluorine should be below applicable exposure levels listed in Section 2 (Composition / Information on Ingredients) before personnel can be allowed in the area without SCBA.

## SECTION 7. HANDLING AND STORAGE

Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. at [www.cganet.com](http://www.cganet.com) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

**STORAGE:** Cylinders should be stored upright (with valve protection caps and valve outlet plugs in place) and firmly secured to prevent falling or being knocked over. Cylinders should be stored in dry, well-ventilated areas. Protect from salt or other corrosive materials. Storage should be away from heavily traveled areas, walkways, elevators, platform edges or other objects or situations that could damage the cylinder wall. Do not store in a manner that will block emergency exits, fire extinguishers or other safety equipment. Do not allow storage temperature to exceed 125°F (52°C). Use a first-in, first-out inventory system to prevent full containers from being stored for long periods of time. Store empty cylinders away from full cylinders. Consideration should be taken to install leak detection and alarm equipment for storage areas. Cylinders must not be recharged except by or with the consent of owner.

**HANDLING:** This mixture can be dangerous and should only be handled by trained personnel. Spectra Gases, Inc., strongly recommends that this gas mixture only be handled in areas with good venting capabilities, preferably a gas handling cabinet. Monitoring may be considered for areas in which this gas mixture is used. Detection of Fluorine odor should trigger immediate response and corrective action.

**Before using this gas, meticulous leak checking using inert gas is strongly recommended, particularly after new connections are made.** Cylinder valves should be inspected regularly for physical damage or corrosion (apparent by discoloration or rust). Cylinder valve inspection should include: neck (where valve inserts into cylinder); bonnet nut (where handle attaches to valve body). Close valve after each use and when empty.

Do not drag, roll, slide or drop cylinder. Use a suitable hand truck designed for cylinder movement. Never attempt to lift a cylinder by its cap. Secure cylinders at all times while in use. Use a pressure regulator to safely discharge product from cylinder. Use a check valve to prevent reverse flow into cylinder. Once cylinder has been connected to properly purged and leak checked process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings; doing so may damage valve, causing a leak to occur. Use an adjustable strap-wrench to remove over-tight or rusted caps.

Do not heat cylinders by any means to increase the discharge rate of product from the cylinder. Never apply flame or localized heat directly to any part of the cylinder. Cylinders should not be artificially cooled as certain types of steel undergo property changes when cryogenically cooled, thus making the cylinder unstable. The failure of a valve can result in violent release of the pressurized gas, creating a severe mechanical injury hazard.

**PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Follow practices indicated in Section 6 (Accidental Release Measures). Purge gas handling equipment with inert gas and relieve pressure before attempting repairs. Systems that have been in fluorine service may become contaminated with a powder residue containing metal fluorides and small amounts of hydrogen fluoride. Use a respirator with dust filters, eye protection and gloves as needed.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

**VENTILATION AND ENGINEERING CONTROLS:** Forced ventilation systems for the general work area should be provided. Spectra Gases, Inc. recommends that cylinders in use be secured within a ventilated enclosure such as a gas cabinet. Employee exposure should be monitored and reduced to the lowest practical levels using ventilation or other appropriate engineering controls.

**RESPIRATORY PROTECTION:** Use positive pressure supplied air respiratory protection if Fluorine levels exceed exposure limits, or during emergency response to a release of this product. If respiratory protection is required, follow the requirements of the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134), standards of Canada, the European Standard EN149, and EC member states.

**EYE PROTECTION:** Use approved safety glasses when cylinders are not closed and capped. Be aware that particles or objects propelled by high pressure gas can fly significant distances. Eyewear should be as described in OSHA 29 CFR 1910.133 or by the European Standard EN166.

**SKIN PROTECTION:** Work gloves (such as leather) are recommended when handling cylinders of this gas. Use appropriate gloves for spill response. If necessary, refer to U.S. OSHA 29 CFR 1910.138 or appropriate Standards of Canada and those of EC Member States.

**OTHER PROTECTIVE EQUIPMENT:** Use body protection appropriate for task. Safety shoes are recommended when handling cylinders. Information on general protective measures can be found in U.S. OSHA 29 CFR 1910.136.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

The following information is for inert components that may be part of this mixture:

	Argon	Helium	Krypton	Neon	Xenon
<b>Molecular Weight</b>	39.95	4.00	83.80	20.183	131.3
<b>Gas Density @ 21.1°C (70°F)</b>	0.103 lb/ft <sup>3</sup> (1.650 kg/m <sup>3</sup> )	0.0103 lb/ft <sup>3</sup> (0.165 kg/m <sup>3</sup> )	0.2172 lb/ft <sup>3</sup> (3.479 kg/m <sup>3</sup> )	0.05215 lb/ft <sup>3</sup> (1.83536 kg/m <sup>3</sup> )	0.3416 lbs ft <sup>3</sup> (5.472 kg/m <sup>3</sup> )
<b>Boiling Point @ 1 atm</b>	-185.9°C (-302.6°F)	-268.9°C (-452.1°F)	-153.4°C (-244.0°F)	-246.0°C (-410.9°F)	-108.2°C (-162.6°F)
<b>Freezing/Metling Point @ 1 atm</b>	-189.2°C (-308.6°F)	None	-157°C (-251°F)	-248.7°C (-415.6°F)	-168°F (-111°C)
<b>Specific Gravity (air = 1) @ 21.1°C (70°F)</b>	1.38	1.38	2.899	0.696	4.560
<b>Solubility in Water vol/vol at 0°C (32°F) and 1 atm</b>	0.056	0.0094	0.0594	0.0105	0.108
<b>Specific Volume @ 21.1°C (70°F)</b>	9.71 ft <sup>3</sup> /lb (0.606 m <sup>3</sup> /kg)	97.09 ft <sup>3</sup> /lb (6.061 m <sup>3</sup> /kg)	4.604 ft <sup>3</sup> /lb (0.287 m <sup>3</sup> /kg)	19.18 ft <sup>3</sup> /lb (1.197 m <sup>3</sup> /kg)	2.927 ft <sup>3</sup> /lb (0.183 m <sup>3</sup> /kg)
<b>Critical Pressure</b>	711.5 psia (4905 kPa abs)	33.0 psia (227 kPa abs)	798.0 psia (5502 kPa abs)	384.9 psia (2654 kPa abs)	847.0 psia (5840 kPa abs)
<b>Odor Threshold</b>	odorless	odorless	odorless	odorless	odorless

The following information is for the fluorine component of this mixture:

	Fluorine
<b>Molecular Weight</b>	38.00
<b>Gas Density @ 21.1°C (70°F)</b>	0.098 lb/ft <sup>3</sup> (1.57 kg/m <sup>3</sup> )
<b>Boiling Point @ 1 atm</b>	-188.2°C (-306.8°F)
<b>Freezing/Metling Point @ 1 atm</b>	-219.7°C (-363.4°F)
<b>Specific Gravity (air = 1) @ 21.1°C (70°F)</b>	1.312
<b>Solubility in Water vol/vol at 0°C (32°F) and 1 atm</b>	
<b>Specific Volume @ 21.1°C (70°F)</b>	10.17 ft <sup>3</sup> /lb (0.635 m <sup>3</sup> /kg)
<b>Critical Pressure</b>	756.4 psia (5215 kPa abs)
<b>Odor Threshold</b>	0.097-0.19 ppm

Information for gas mixture:

**APPEARANCE, ODOR AND STATE:** Colorless gas with pungent odor.

**WARNING PROPERTIES FOR THIS GAS MIXTURE:** The odor and its lacrymation properties can be distinctive warning properties associated with this gas mixture.

## SECTION 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** Argon, Helium, Krypton, Neon and Xenon are inert and stable. Fluorine reacts with water or moisture in the air (see hazardous decomposition products below).

**CONDITIONS TO AVOID:** Cylinders should not be exposed to temperatures in excess of 125°F (52°C).

**MATERIALS WITH WHICH GAS MIXTURE IS INCOMPATIBLE:** Although the components of greatest percentage are inert, the Fluorine present in this mixture will react with nearly all organic and inorganic materials. Reactions of Fluorine with bases may be violent. While pure Fluorine very strongly enhances the oxidization (burning and/or corrosion) of all metals, the dilute concentration of Fluorine in this gas mixture lessens the incompatibility hazards. Properly prepared systems of stainless steel (316 type), copper, nickel or Monel can be appropriate for this mixture. All equipment should be free of grease or oils ("cleaned for oxygen service"). Do not use brass gas handling equipment.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** Fluorine reacts with water or moisture in the air to form a mixture containing hydrogen fluoride or hydrofluoric acid, plus small amounts of ozone, hydrogen peroxide and oxygen fluoride.

**B) HAZARDOUS POLYMERIZATION:** Will not occur.

## SECTION 11. TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** There are no specific toxicology data for Argon, Helium, Krypton, Neon or Xenon. These gases are simple asphyxiants, which cause suffocation by replacing air (oxygen). Suffocation without warning is not likely with this mixture because the fluorine component provides an odor warning. The following toxicological data are available for pure Fluorine.

Mutation in Microorganisms-Salmonella typhimurium 1 mg/plate

Eye effects-Human 25 ppm/5 minutes: Mild irritation effects

Eye effects-Rat 140 ppm/30 minutes

Eye effects-Mouse 467 ppm/5 minutes

Eye effects-Dog, adult 68 ppm/1 hour

Inhalation-Rat LC<sub>50</sub>: 185 ppm/1 hour

Inhalation-Mouse LC<sub>50</sub>: 150 ppm/1 hour

Inhalation-Rabbit, adult LC<sub>50</sub>: 270 ppm/30 minutes

Inhalation-Guinea Pig, adult LC<sub>50</sub>: 170 ppm/1 hour

Inhalation-dog LC: >93 ppm/1 hour: Lungs, Thorax, or Respiration - cough: Lungs, Thorax, or Respiration - dyspnea: Gastrointestinal - nausea or vomiting

Note: In the absence of toxicological information for a specific mixture, the following formula is published by these agencies/groups for classifying toxicity of a gas mixture with one toxic component:

US Dept. of Transportation (D.O.T.) (49 CFR 173.133(b)); Compressed Gas Association (CGA P-20)

International Air Transport Association (IATA 3.2.3);

National Fire Protection Association (NFPA 55 2003 ed.) ref CGA P-20

$$LC_{50}(\text{mix}) = \frac{\text{LC}_{50} \text{ of toxic component (in ppm)}}{\text{concentration of toxic component (in decimal percent)}}$$

$$\text{Calculated LC}_{50}(\text{1\% fluorine mix}) = 18,500 \text{ ppm}$$

**CARCINOGENICITY:** The components of this gas mixture have not been found to be carcinogenic.

**IRRITANCY OF PRODUCT:** This gas mixture may be mildly to severely irritating.

**SENSITIZATION OF PRODUCT:** The components of this gas mixture are not known to be human skin or respiratory sensitizers.

**REPRODUCTIVE TOXICITY INFORMATION:**

**Mutagenicity:** The components of this gas mixture are not reported to cause mutagenic effects in humans. Fluorine, a component of this gas mixture, has been reported to cause mutagenic effects in specific animal tissues during experimental studies with exposures at relatively high doses.

**Embryotoxicity:** The components of this gas mixture are not reported to cause embryotoxic effects in humans.

**Teratogenicity:** The components of this gas mixture are not reported to cause teratogenic effects in humans.

**Reproductive Toxicity:** The components of this gas mixture are not reported to cause adverse reproductive effects in humans.

**BIOLOGICAL EXPOSURE INDICES (BEIs):** Biological Exposure Indices (BEIs) are applicable for Fluorine (a component of this gas mixture), as follows.

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
FLUORIDES •Fluorides in urine	• Prior to shift • End of shift	•3 mg/g creatinine • 10 mg/g creatinine

## SECTION 12. ECOLOGICAL INFORMATION

**ENVIRONMENTAL STABILITY:** Argon, Helium, Krypton, Neon and Xenon occur naturally in the atmosphere. In natural waters containing calcium and other alkali and alkaline earth metals, fluorine will precipitate out as calcium fluoride and other fluoride salts, and thus will naturally neutralize. Additionally, Fluorine reacts with water or moisture in the air to form a hydrogen fluoride or hydrofluoric acid. All work practices should be aimed at eliminating environmental contamination.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Due to the potentially toxic nature of this gas mixture, animals exposed to this product will experience tissue damage, burns, and may be killed. Plants contaminated with this product may be adversely affected or destroyed. The following phytotoxicity data are available for the components of this gas mixture:

**FLUORINE:** EC<sub>50</sub> (*Lemna minor* duckweed) 4 weeks = > 60,000 µg/L

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** Fluorine, a component of this gas mixture, can be detrimental to aquatic life. If a large release of this product occurs near a river or other body of water, there is a potential for fish and other aquatic life to be harmed or killed. The following aquatic toxicity data are currently available for Fluorine, a component of this gas mixture:

**FLUORINE:** TLM (trout) time period not specified = 2.3 ppm (fresh water)

**MOBILITY:** Argon, Helium, Krypton, Neon and Xenon are inert and do not present a hazard of mobility. Due to the reaction of Fluorine to hydrofluoric acid, it will not be mobile in soil.

**PERSISTENCE AND BIODEGRADABILITY:** Persistence: Argon, Helium, Krypton, Neon and Xenon are natural elements and present no hazard of persistence. Fluorine will react to form hydrofluoric acid that will dissipate by natural alkalinity. Biodegradation: All components of this gas mixture will biodegrade.

**POTENTIAL TO BIOACCUMULATE:** No data available.

**OZONE-DEPLETION POTENTIAL:** The components of this gas mixture are not a Class I or Class II ozone depleting chemicals (40 CFR Part 82).

## SECTION 13. DISPOSAL CONSIDERATIONS

**UNUSED PRODUCT / EMPTY CONTAINER:** Do not dispose of residual product remaining in cylinder. Return cylinder to: Spectra Gases, Inc., 80 Industrial Drive, Alpha, NJ 08865.

**DISPOSAL INFORMATION:** Residual product in system can be neutralized using various caustic systems (e.g., activated alumina or soda lime). Disposal shall be done in accordance with U.S. Federal, State and local regulations, regulations of the provinces of Canada or EC member states.

## SECTION 14. TRANSPORT INFORMATION

### SHIPPING INFORMATION:

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (fluorine, argon) **or** (fluorine, helium) **or** (fluorine, neon) **or** (fluorine, krypton) **or** (fluorine, xenon)

**HAZARD CLASS NUMBER and DESCRIPTION:** 2.2 (Non-Flammable Gas)

**UN IDENTIFICATION NUMBER:** UN 1956

**SHIPPING LABEL(S) REQUIRED:** Class 2.2 (Non-Flammable Gas)

**PLACARD (When required):** Class 2.2 (Non-Flammable Gas)

**SPECIAL SHIPPING INFORMATION:** Cylinders should be transported in a secure position (never transport in passenger compartment of a vehicle). Ensure cylinder valve is properly closed, valve outlet plug has been reinstalled, and valve protection cap is secured before shipping cylinder.

**CAUTION:** Compressed gas cylinders shall not be refilled except by qualified producers of compressed gases. Shipment of a compressed gas cylinder that has not been filled by the owner or with the owner's written consent is a violation of Federal law (49 CFR 173.301).

**NAERG (NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK) #: 126**

### ADDITIONAL SHIPPING INFORMATION:

#### CANADA:

This gas is considered as Dangerous Goods, per regulations of Transport Canada. The use of the above U.S. DOT information from the U.S. 49 CFR regulations is allowed for shipments that originate in the U.S. For shipments via ground vehicle or rail that originate in Canada, the following additional information is provided.

<b>SPECIAL PROVISIONS:</b>	None
<b>EXPLOSIVE LIMIT &amp; LIMITED QUANTITY INDEX:</b>	0.12
<b>ERAP INDEX:</b>	None
<b>PASSENGER CARRYING SHIP INDEX:</b>	None
<b>PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX:</b>	75

**SECTION 14. TRANSPORT INFORMATION (cont'd)****INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA):**

This gas mixture is considered as dangerous goods, per the International Air Transport Association.

The following Packaging Information is applicable to this product:

PASSENGER AND CARGO AIRCRAFT				CARGO AIRCRAFT ONLY	
Limited Quantity		Packing Instruction	Max. Qty per Pkg	Packing Instruction	Max. Qty per Pkg
Packing Instruction	Max. Qty per Pkg				
//////	//////	200	75 kg	200	150 kg

**INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO):**

This gas mixture is considered as dangerous goods, per the International Maritime Organization.

**SUBSIDIARY RISK:** None  
**PACKING GROUP:** None  
**SPECIAL PROVISIONS:** 274  
**LIMITED QUANTITIES:** 120 mL  
**PACKING INSTRUCTIONS:** P200  
**EmS:** F-C, S-U  
**STOWAGE CATEGORY:** Category D. Clear of living quarters.  
**MARINE POLLUTANT:** The components of this gas mixture are not designated by the IMO to be Marine Pollutants.

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR):**

This gas mixture is considered to be dangerous goods by the Economic Commission for Europe. The following additional information specific to Europe is provided.

**CLASS:** 2  
**CLASSIFICATION CODE:** IA  
**PACKING GROUP:** Not Applicable  
**LABELS:** 2.2  
**SPECIAL PROVISIONS:** 274, 567  
**LIMITED QUANTITIES:** LQ1  
**PACKING INSTRUCTIONS:** P200  
**MIXED PACKING PROVISIONS:** MP9  
**HAZARD IDENTIFICATION No.:** 20

**SECTION 15. REGULATORY INFORMATION****U.S. FEDERAL REGULATIONS:****EPA - ENVIRONMENTAL PROTECTION AGENCY:**

**CERCLA:** Comprehensive Environmental Response, Compensation, and Liability Act of 1990  
 (40 CFR Parts 117 and 302)

Reportable Quantity (RQ): Fluorine = 10 lb. (4.54 kg)

**SARA TITLE III:** Superfund Amendment and Reauthorization Act

**SECTIONS 302/304:** Emergency Planning and Notification (40 CFR Part 355)

Extremely Hazardous Substances: Argon, Helium, Krypton, Neon and Xenon are not listed.  
 Fluorine is listed.

Threshold Planning Quantity (TPQ): Fluorine = 500 lb. (227.5 kg)

Reportable Quantity (RQ): Fluorine = 10 lb. (4.54 kg)

**SECTIONS 311/312:** Hazardous Chemical Reporting (40 CFR Part 370)

IMMEDIATE HEALTH: Yes                      PRESSURE: Yes

DELAYED HEALTH: Yes                      REACTIVITY: Yes

FIRE: No

**SECTION 313:** Toxic Chemical Release Reporting (40 CFR 372)

Releases of Fluorine require reporting under Section 313.

**CLEAN AIR ACT:**

**SECTION 112 (r):** Risk Management Programs for Chemical Accidental Release  
 (40 CFR Part 68)

Threshold Planning Quantity (TPQ): Fluorine = 1000 lb (454 kg)

**TSCA:** Toxic Substances Control Act

Argon, Krypton, Neon, Helium, Xenon and Fluorine are listed on the TSCA Inventory.

**SECTION 15. REGULATORY INFORMATION (Continued)****OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:**

**29 CFR Part 1910.119:** Process Safety Management of Highly Hazardous Chemicals.

Threshold Planning Quantity (TPQ): Fluorine = 1000 lb (454 kg)

**CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65):** No component of this gas mixture is a listed substance which the State of California requires warning under this statute.

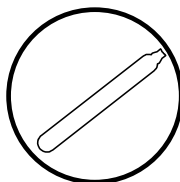
**CANADIAN FEDERAL REGULATIONS:**

**CANADIAN DSL INVENTORY STATUS:** All components of this gas mixture are listed on the Canadian DSL Inventory.

**OTHER CANADIAN REGULATIONS:** This gas mixture would be categorized as a Controlled Product, Hazard Classes A, and D2, as per the Controlled Product Regulations. The inert gases are not on the CEPA Priorities Substances Lists. Fluorine (as an Inorganic Fluoride compound) would be on the First Priorities Substances List (Toxic).

**CANADIAN WHMIS CLASSIFICATION and SYMBOLS:**

**Class A:** Compressed Gas

**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:**

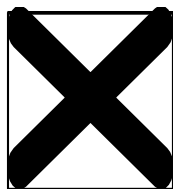
**EC LABELING AND CLASSIFICATION:** This product meets the following definition, per the European Community Council Directive 67/548/EEC.

**EC CLASSIFICATION:** Xn (Harmful)

**EC RISK PHRASES:** Harmful. [R: 20]

**EC SAFETY PHRASES:** Keep locked up and out of the reach of children.\* *\*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.* Keep container tightly closed and in a well ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S:(1/2)\*, 7/9, 26, 36/37/39, 45]

**EUROPEAN COMMUNITY ANNEX II HAZARD SYMBOL:**

**EUROPEAN COMMUNITY INFORMATION FOR COMPONENTS:****INERT COMPONENTS (ARGON, HELIUM, KRYPTON, NEON, XENON):**

**EC EINECS/ELINCS NUMBER:** See MSDS Section 2.

**EC CLASSIFICATION:** An official classification for each of the above listed inert components of this gas mixture has not been published in Commission Directives.

**FLUORINE:**

**EC EINECS/ELINCS NUMBER:** 231-954-8

**EC CLASSIFICATION:** Very Toxic; Very Toxic by Inhalation; May Cause Fire; Causes Severe Burns: [R 7; T+; C]

**EC RISK PHRASES:** May cause fire. Very toxic by inhalation. Causes severe burns. [R: 7, 26, 35]

**EC SAFETY PHRASES:** Keep locked up and out of the reach of children.\* *\*This safety phrase can be omitted from the label when the substance or preparation is sold for industrial use only.* Keep container tightly closed and in a well ventilated place. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show label where possible). [S:(1/2)\*, 7/9, 26, 36/37/39, 45]

**EC COMMENTS:** In terms of Fluorine toxicity, use the following concentration limits:

$C \geq 10\%$ : Causes severe burns. [R: 35]

$7\% \leq C < 10\%$ : Very Toxic. [R: 26-35]

$5\% \leq C < 7\%$ : Toxic by inhalation. [R: 26-34]

$1\% \leq C < 5\%$ : Toxic. [R: 23-34]

$0.1\% \leq C < 1\%$ : Harmful. [R: 20]

**Product:** This gas mixture contains < 1% Fluorine and meets the requirements for classification and labeling for dangerous substances under European Community Standards.



**SECTION 16. OTHER INFORMATION**

Information contained in this Material Safety Data Sheet is provided to our customers so they may comply with 29 CFR 1910.1200, Hazard Communication Standard, the Canadian WHMIS Standard, and the requirements of the European Community Directives. The intent of this Material Safety Data Sheet is to provide end users of this product with the health and physical hazards associated with possible exposure to this product. All statements, technical data and recommendations are based on readily available texts and data that Spectra Gases, Inc., believes to be reliable and accurate. Spectra Gases, Inc., makes no warranties, guarantees or representations of any kind with respect to this product or this data. It is the responsibility of the user to obtain and use the most recent version of this MSDS.

Further information about compressed gases can be found in the following pamphlets published by: Compressed Gas Association Inc. (CGA), 1725 Jefferson Davis Highway, Suite 1004, Arlington, VA 22202-4102. Telephone: (703) 412-0900.

*P-1* "Safe Handling of Compressed Gases in Containers"  
*AV-1* "Safe Handling and Storage of Compressed Gases"  
"Handbook of Compressed Gases"

For Definition of Terms used in Spectra MSDSs see Spectra Gases, Inc. website: [www.spectra-gases.com](http://www.spectra-gases.com). Or contact your Customer Service Representative.

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**REVISION HISTORY:** 7/9/04: General up-date and review MSDS. Up-date of Section 14 shipping information.  
8/2/04: Section 9 -corrected Helium solubility in water to 0.0094,  
12/7/04: Sec. 1 updated phone #s, Sec. 9 added F2 info  
1/4/04: Sec. 3 added/rev. chronic exposure symptoms  
5/10/05: General edit .  
6/7/06: Sec. 3 clarified chronic exposure symptoms/corrosive nature of this gas mix  
10/23/07 Sec. 15 removed WHMIS D2 classification