



# MATERIAL SAFETY DATA SHEET

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

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** 5.0-10.0% Hydrogen Chloride, 0.0-2.0% Hydrogen in HELIUM, or NEON  
**CHEMICAL NAME:** Mixture of Hydrogen Chloride (5.0%), Hydrogen (0.0-2.0%) in Helium or Neon (Balance)  
**FORMULA:** Hydrogen Chloride = HCl; Helium = He; Hydrogen = H<sub>2</sub>; Neon = Ne  
**SYNONYMS:** Not Applicable  
**U.S./MANUFACTURER:** SPECTRA GASES, INC.  
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 Branchburg, NJ 08876, U.S.A.  
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**WEB SITE:** www.spectra-gases.com  
**SPECTRA GASES EMERGENCY CONTACT:** 800-932-0624 (U.S., Canada) 8:30 am - 7:00 pm (EST)  
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 +1-703-527-3887 (International)

**PRODUCT USE:** In Excimer Laser and Research and Development

ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-2004 format. This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR. The product is also classified per all applicable EU Directives through EC 1907: 2006

## SECTION 2. HAZARD IDENTIFICATION

**EU LABELING AND CLASSIFICATION:** An official classification has not been published in the European Union Council Directive 67/548/EEC or subsequent Directives. The following is a self-classification, based on current guidelines under EC 1907: 2006.

**EU CLASSIFICATION:** Xi (Irritant)

**EU RISK PHRASES:** R: 36/37/38

**EU SAFETY PHRASES:** S:(1/2)\*, S: 7/9, S: 26, S: 36/37/39, S: 45

See Section 15 for full definition of Risk and Safety Phrases.

**EMERGENCY OVERVIEW: Product Description:** This gas is a colorless, non-flammable gas mixture with a pungent odor (due to the presence of Hydrogen Chloride), shipped under pressure. **Health Hazards:** This gas mixture may cause significant, adverse health effects because of the Hydrogen Chloride content, which can reach exposure limits at the level present in this mixture. Pure Hydrogen Chloride is a very corrosive to all tissues, subsequently releases of this product should be responded to with extreme caution. Hydrogen Chloride 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. Persons responding to releases of this gas mixture must protect themselves appropriately. **Flammability Hazards:** This gas mixture is not flammable. If involved in a fire, this gas mixture will evolve hydrogen and chlorine. **Reactivity Hazards:** This gas mixture can react with water to form acidic solutions. **Environmental Hazards:** Release of this mixture may cause harm to the environment. **Emergency Response Considerations:** Persons who respond to releases of this product must protect themselves from inhalation of this gas mixture, especially in areas which are downwind of the release. Persons responding to releases of this gas must use extreme caution and protect themselves appropriately.

## SECTION 3. COMPOSITION and INFORMATION ON INGREDIENTS

(10,000 ppm = 1%)

CHEMICAL NAME	CAS #	EINECS#	Mole%	European Hazard Classification Risk Phrases Safety Phrases
Hydrogen Chloride	7647-01-0	231-595-7	5.0-10.0%	HAZARD CLASSIFICATION: C (Corrosive); Xi (Irritant) RISK PHRASES: R: 34; R: 37 SAFETY PHRASES: S: 1/2; S: 26, S: 45
Hydrogen	1333-74-0	215-605-7	0.0-2.0%	HAZARD CLASSIFICATION: F+ (Extremely Flammable) RISK PHRASES: R: 12 SAFETY PHRASES: S: 9; S: 16, S: 33
Helium	7440-59-7	231-168-5	0.0-95.0%	HAZARD CLASSIFICATION: Not Applicable RISK PHRASES: Not Applicable SAFETY PHRASES: Not Applicable
Neon	7440-01-9	231-110-9	0.0-95.0%	HAZARD CLASSIFICATION: Not Applicable RISK PHRASES: Not Applicable SAFETY PHRASES: Not Applicable

See Section 15 for full definition of Risk and Safety Phrases.

## SECTION 4. FIRST AID MEASURES

**EYE CONTACT:** If this gas mixture contaminates the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 20 minutes. Administer anesthetic eye drops after one minute of flushing if victim suffers from spasms to the eyes, in order to facilitate irrigation. In the event of a severe overexposure, victim should consult with an ophthalmologist. In the event of mechanical injury, cover eye with bandage and seek appropriate medical attention.

**INGESTION:** Ingestion is an unlikely 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. In the event of severe, immediate effects or delayed symptoms which develops after exposure, victim must seek appropriate medical attention.

**SKIN CONTACT:** If this gas mixture contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim should seek appropriate medical attention if symptoms persist. In case of frostbite, place the frostbitten part in warm water. **DO NOT USE HOT WATER.** If warm water is not available, or is impractical to use, wrap the affected parts gently in blankets. Alternatively, if the fingers or hands are frostbitten, place the affected area in the armpit. Encourage victim to gently exercise the affected part while being warmed. Seek immediate medical attention.

**MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE:** Pre-existing dermatitis, other skin conditions, and respiratory disorders may be aggravated by over-exposure to this gas mixture.

**NOTES TO PHYSICIANS:** Administer oxygen, if necessary, and treat symptoms.

**For Inhalation Exposure:** Administer 100% oxygen at half-hour intervals for three to four hours for victims of minor inhalation exposure. For serious inhalation exposure, 100% oxygen administration should begin immediately, under positive pressure (< 4 cm) for half-hour periods for at least six hours until breathing is easy and the color of the skin and mucous membranes is normal.

**For Skin Contact:** For skin contamination, all areas of exposure should be flushed with copious quantities of water, followed by an iced aqueous or alcoholic solution of 0.13% benzalkonium chloride, iced 70% alcohol, or an ice-cold saturated solution of magnesium sulfate. If the area of burn cannot be drenched or immersed in solution, apply cold compresses containing the materials of the solution. After the iced solution treatment, application of a paste of powdered magnesium oxide and glycerin should be administered. The paste should be applied daily for several days.

**For Eye Contact:** Exposed eyes should be flushed for 20 minutes, and the following additional treatment be provided: Treat with a continuous drip of normal, sterile saline. No oils or ointments should be used.

## SECTION 5. FIRE FIGHTING MEASURES

**FLASH POINT:** Not Applicable

**AUTOIGNITION:** Not Applicable

**FLAMMABLE RANGE:** Not Applicable

**NFPA RATINGS:** HEALTH: = 3      FLAMMABILITY: = 0  
INSTABILITY: = 1      SPECIAL: None

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

**EXTINGUISHING MEDIA NOT TO BE USED:** None known.

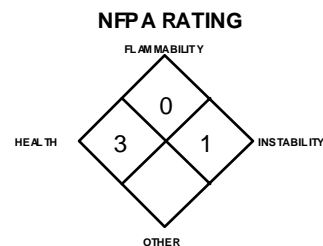
**SPECIAL FIRE-FIGHTING PROCEDURES:** Non-flammable. Use extinguishing media appropriate for surrounding fire. In the event of fire, cool containers of this product with water spray to prevent failure.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This gas mixture can severely irritate the skin, eyes, and other contaminated tissues; subsequently, it presents a significant health hazard to firefighters. Exposure to high heat, as in a fire situation, can cause the cylinder to rupture.

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

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

**HAZARDOUS COMBUSTION PRODUCTS:** The inert gases in this mixture will not decompose in fire to produce toxic compounds. At 1800°C (3272°F) Hydrogen Chloride will decompose into hydrogen and chlorine.



## SECTION 6. ACCIDENTAL RELEASE MEASURES

**STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:**

- Close the gas source if possible to do so safely.
- Evacuate area.
- Prior to re-entry, area should be monitored to ensure HCl level is below exposure limits shown in Section 8 (Exposure Controls/Personal Protection).
- Any contaminated clothing should be removed and laundered separately before reuse.
- Contact your supplier if leak was from the cylinder, cylinder valve or the valve pressure relief device (PRD).

Notes for trained emergency responders:

- Self-Contained Breathing Apparatus (SCBA) and personal protective equipment protective against Hydrogen Chloride exposure should be used when entering contaminated area.
- Monitor area for HCl levels.
- When responding to a release of pressurized gas, be aware of the severe hazard of mechanical injury in the event of valve failure or other event causing a rapid release of cylinder contents.
- Attempt to close the main source valve prior to entering the area.

**SECTION 6. ACCIDENTAL RELEASE MEASURES (cont'd)**

- A water fog or mist can be used to control the vapor cloud which may result from the release. Do not direct a water spray directly at the source of release.
- Locate and seal the source of the leaking gas.
- If it is not possible to stop release, allow remaining gas to release in-place or remove gas cylinder to a safe area and allow the gas to be released there.
- If leak is in user's gas handling equipment or system, close cylinder valve, purge and safely vent high pressure before attempting repairs.
- Do not flush contaminated water down the sewer systems. Flush into a retention area, and neutralize with soda ash or limestone. Dilute with large amounts of water, then dispose of according to local regulations.

**SECTION 7. HANDLING AND STORAGE****STORAGE:**

- Cylinders should be stored upright (with valve protection caps or plugs in place) and firmly secured to prevent falling or being knocked over. Cylinders should be stored in dry, well-ventilated areas. Do not allow storage temperature to exceed 125°F (52°C). 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.
- 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.
- Cylinders must not be recharged except by or with the consent of owner.
- Consider installation of leak detection and alarm systems for storage areas.
- Isolate from incompatible chemicals (refer to Section 10, Stability and Reactivity).
- Use only DOT or ASME code cylinders designed for compressed gas storage.

**HANDLING:**

- **This gas mixture can be dangerous and should only be handled by trained personnel. Spectra Gases, Inc., strongly recommends the following: handle only in areas with extensive venting capabilities, preferably a gas handling cabinet; before use do meticulous leak checking using inert gas -- particularly after new connections are made; monitoring may be considered for areas in which this gas mixture is used. Detection of Hydrogen Chloride odor should trigger immediate response and corrective action.**
- Eye wash stations/safety showers should be near areas where this product is used or stored.
- 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.
- Inspect cylinder valves regularly for physical damage or corrosion (apparent by discoloration or rust). Valve inspection should include neck (where valve inserts into cylinder) and bonnet nut (where handle attaches to valve body).
- Use an adjustable strap-wrench to remove over-tight or rusted caps.
- 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 process, open cylinder valve slowly and carefully. If user experiences any difficulty operating cylinder valve, discontinue use and contact supplier.
- Close valve after each use and when empty.
- Never tamper with pressure relief devices in valves and cylinders. Never insert an object (e.g., wrench, screwdriver, etc.) into valve cap openings; doing so may damage valve, causing leak to occur.
- Do not heat cylinders 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.
- Hydrogen Chloride becomes corrosive when it comes into contact with moisture. Hydrochloric acid will corrode gas handling systems and other metal structures, possibly causing leaks and damage to expensive equipment.

**PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT:** Purge gas handling equipment with inert gas and relieve pressure before attempting repairs.

**SPECIAL PRECAUTIONS:** Always store and handle compressed gas cylinders in accordance with Compressed Gas Association, Inc. (telephone 703-412-0900) pamphlet CGA P-1, *Safe Handling of Compressed Gases in Containers*. Local regulations may require specific equipment for storage and use.

## 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.

### EXPOSURE LIMITS:

Chemical Name	CAS #	OSHA PELs ppm	ACGIH TLVs ppm	NIOSH RELs ppm	NIOSH IDLH ppm	DFG MAKs ppm	AIHA WEELs ppm
Hydrogen Chloride	7647-01-0	STEL = 2 (ceiling)	TWA = 2 (ceiling)	STEL = 5 (ceiling)	50	TWA = 3 PEAK = 2•MAK15 min. average value, 1-hr interval, 4 per shift	NE
Helium	7440-59-2	Simple Asphyxiant					
Hydrogen	1333-74-0	Simple Asphyxiant					
Neon	7440-01-9	Simple Asphyxiant					

NE = Not Established

**INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS:** In addition to the exposure limit values cited in this section, other exposure limits have been established by various countries for Hydrogen Chloride. The exposure limits given may not be the most current; individual country authorities should be contacted to check on more current limits.

Australia: TWA = 5 ppm (7 mg/m<sup>3</sup>), JAN 1993  
 Belgium: STEL = 5 ppm (7.7 mg/m<sup>3</sup>), JAN 1993  
 Denmark: CL = 5 ppm (7 mg/m<sup>3</sup>), OCT 2002  
 EC: TWA = 5 ppm (8 mg/m<sup>3</sup>); STEL = 10 ppm (15 mg/m<sup>3</sup>), FEB 2006  
 Finland: STEL = 5 ppm (7 mg/m<sup>3</sup>), Skin, JAN 1999  
 France: VLE = 5 ppm (7.5 mg/m<sup>3</sup>), JAN 1999  
 Germany: MAK = 3 mg/m<sup>3</sup> (2 mL/m<sup>3</sup>), 2005  
 Hungary: STEL = 5 mg/m<sup>3</sup>, JAN 1993

Japan: OEL-C = 5 ppm (7.5 mg/m<sup>3</sup>), MAY 2006  
 Korea: CL = 5 ppm (7.5 mg/m<sup>3</sup>), 2006  
 Mexico: Peak = 5 ppm (7 mg/m<sup>3</sup>), 2004  
 The Netherlands: MAC-TGG = 8 mg/m<sup>3</sup>, 2003  
 New Zealand: CL = 5 ppm (7.5 mg/m<sup>3</sup>), JAN 2002  
 Norway: TWA = 5 ppm (7 mg/m<sup>3</sup>), JAN 1999  
 The Philippines: TWA = 5 ppm (7 mg/m<sup>3</sup>), JAN 1993  
 Poland: MAC(TWA) = 5 mg/m<sup>3</sup>, CEILING = 7 mg/m<sup>3</sup>, JAN 1999

Russia: STEL = 5 mg/m<sup>3</sup>, JUN 2003  
 Sweden: STEL = 5 ppm (8 mg/m<sup>3</sup>) JAN 1999  
 Switzerland: MAK-W = 5 ppm (7.5 mg/m<sup>3</sup>), KZG-W = 10 ppm (15 mg/m<sup>3</sup>), JAN1999  
 Thailand: TWA = 5 ppm (7 mg/m<sup>3</sup>), JAN 1993  
 Turkey: TWA = 5 ppm (7 mg/m<sup>3</sup>), JAN 1993  
 United Kingdom: TWA = 1 ppm (2 mg/m<sup>3</sup>); STEL 5 ppm (gas, mist), 2005  
 In Argentina, Bulgaria, Colombia, Jordan, Singapore, Vietnam check ACGIH TLV

*The following information on appropriate Personal Protective Equipment is provided to assist employers in complying with OSHA regulations found in 29 CFR Subpart I (beginning at 1910.132), equivalent standards of Canada (including CSA Standard Z94.4-02 and CSA Standard Z94.3-02), or standards of EU member states (including EN 529:2005 for respiratory PPE, CEN/TR 15419:2006 for hand protection, and CR 13464:1999 for face/eye protection). Please reference applicable regulations and standards for relevant details.*

**RESPIRATORY PROTECTION:** Maintain exposure levels of Hydrogen Chloride below the levels listed above. Use supplied air respiratory protection if Hydrogen Chloride 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), or equivalent U.S. State standards, standards of Canada, the European Standard EN 529:2005, and EU member state standards. The following guidelines, based NIOSH respiratory protection recommendations, are for Hydrogen Chloride.

#### CONCENTRATION RESPIRATORY EQUIPMENT of HYDROGEN CHLORIDE

Up to 5,000 ppm Chemical cartridge respirator or a Supplied Air Respirator (SAR)  
 Up to 100 ppm SAR operated in a continuous-flow mode, or a Powered Air Purifying Respirator (PAPR) with Hydrogen Chloride cartridges, or a gas mask with a Hydrogen Chloride canister, or a SCBA.  
 Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: an SCBA or positive pressure, full-faced SAR with an auxiliary SCBA.  
 Escape Gas mask or mouth-piece respirator with Hydrogen Chloride cartridges or SCBA should be used.

**EYE PROTECTION:** Use approved safety goggles or safety glasses when cylinders are not closed and capped. Be aware that particles or objects propelled by high pressure gas can fly significant distances. If necessary, refer to U.S. OSHA 29 CFR 1910.133, Canadian CSA Standard Z94.3-07 or the European Standard CR 13464:1999. Eye wash stations/safety showers should be available.

**SKIN PROTECTION:** Work (such as leather) gloves 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, appropriate Standards of Canada or the European Standard CEN/TR 15419:2006.

**OTHER PROTECTIVE EQUIPMENT:** Use body protection appropriate for task. Safety shoes are recommended when handling cylinders. If necessary, refer to the OSHA Technical Manual (Section VII: Personal Protective Equipment) appropriate Standards of Canada or the European Standard CEN/TR 15419:2006. If a hazard of injury to the feet exists due to falling objects, rolling objects, where objects may pierce the soles of the feet or where employee's feet may be exposed to electrical hazards, use foot protection, as described in U.S. OSHA 29 CFR 1910.136 and the Canadian CSA Standard Z195-M1984, *Protective Footwear*.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

The following information is for Helium, a possible balance gas of this mixture:

**MOLECULAR WEIGHT:** 4.00  
**GAS DENSITY @ 21.1°C (70°F):** 0.0103 lb./ft<sup>3</sup> (0.165 kg/m<sup>3</sup>)  
**BOILING POINT @ 1 atm:** -268.9°C (-452.1°F)  
**FREEZING/MELTING POINT @ 1 atm:** None.  
**SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F):** 1.38  
**SOLUBILITY IN WATER vol/vol at 0°C (32°F) and 1 atm:** 0.0094  
**SPECIFIC VOLUME @ 21.1°C (70°F):** 97.09 ft<sup>3</sup>/lb (6.061 m<sup>3</sup>/kg)  
**CRITICAL PRESSURE:** 33.0 psia (227 kPa abs)  
**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

The following information is for Neon, a possible balance gas of this mixture:

**MOLECULAR WEIGHT:** 20.183  
**GAS DENSITY @ 21.1°C (70°F):** 0.05215 lb./ft<sup>3</sup> (1.83536 kg/m<sup>3</sup>)  
**BOILING POINT @ 1 atm:** -246.0°C (-410.9°F)  
**FREEZING/MELTING POINT @ 1 atm:** -248.7°C (-415.6°F)  
**SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F):** 0.696  
**SOLUBILITY IN WATER vol/vol at 0°C (32°F) and 1 atm:** 0.0105  
**SPECIFIC VOLUME @ 21.1°C (70°F):** 19.18 ft<sup>3</sup>/lb (1.197 m<sup>3</sup>/kg)  
**CRITICAL PRESSURE:** 384.9 psia (2654 kPa abs)

The following information is for the Hydrogen Chloride component of this gas mixture.

**ODOR THRESHOLD:** 1-5 ppm (detection for Hydrogen Chloride)

Information for gas mixture:

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

**WARNING PROPERTIES FOR THIS GAS MIXTURE:** The odor is a distinctive warning property associated with this gas mixture. A leak may also be accompanied by a white vapor cloud.

## SECTION 10. STABILITY AND REACTIVITY

**CHEMICAL STABILITY:** Neon, Helium are inert and stable. Hydrogen Chloride will fume to form hydrochloric acid mist in air. The hydrogen component is below its lower flammability limit in this mix.

**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 (Neon and Helium) are inert, the Hydrogen Chloride present in this mixture is not compatible with most metals, alcohols, potassium permanganate, sodium metal, fluorine, metal acetylides, carbides, acetic anhydride, ammonia and ammonium hydroxide, caustics, sulfuric acid, perchloric acid, and with many organic compounds with reactive functional groups. The Hydrogen component is incompatible with strong oxidizers such as chlorine, bromine, pentafluoride, oxygen, oxygen difluoride and nitrogen trifluoride.

### REACTIVITY:

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** *Combustion:* Hydrogen Chloride, a component of this gas mixture, will decompose at 1800°C (3272°F) to form hydrogen gas and chlorine. *Hydrolysis:* Hydrogen Chloride will react with water to form acidic solutions.

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

## SECTION 11. TOXICOLOGICAL INFORMATION

**ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE: WARNING** - If rescue personnel need to enter an area suspected of having a toxic level of Hydrogen Chloride (a component of this gas mixture), they should be equipped with Self-Contained Breathing Apparatus (SCBA), and, if available, a full-body, chemically resistant suit. High concentration of this gas will create an oxygen-deficient atmosphere, creating the risk of asphyxiation. Acute overexposure to this gas mixture may cause the following health effects:

**EYE CONTACT:** Minor contact with this gas will cause tearing and irritation including swelling and redness, due to the presence of Hydrogen Chloride. Severe over-exposure to the eyes has the potential to cause burns if contact is prolonged. Release of a high-pressure gas may result in airborne objects.

**INGESTION:** Ingestion of this gas mixture is not a likely route of industrial exposure.

**INHALATION:** This gas mixture can cause significant, adverse effects, due to the presence of Hydrogen Chloride, which is extremely corrosive. Minor inhalation exposure of this gas mixture may cause irritation to the lungs, nose, throat and mucous membranes, resulting in coughing and breathing difficulty. In the event of prolonged inhalation overexposures, there is the potential for tissue damage. Severe inhalation over-exposure may result in pulmonary edema (an accumulation of fluid in the lungs), a potentially fatal condition. The symptoms associated with specific Hydrogen Chloride concentrations are as follows:

<b>SECTION 11. TOXICOLOGICAL INFORMATION (Continued)</b>
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<u>CONCENTRATION</u>	<u>SYMPTOM(s)</u>
1-5 ppm	Odor Threshold
3 ppm	The maximum concentration that can be tolerated for up to 1 hour with only transient effects.
20 ppm	Maximum concentration that can be tolerated for up to 1 hour without development of irreversible or other serious effects that would impair individual from taking protective action.
150 ppm	Maximum concentration that can be tolerated for up to 1 hour without developing life-threatening effects.
1000 - 1300 ppm	Fatal to human within a few minutes.

Exposure to concentrations in excess of 1300 ppm may cause laryngeal spasms, resulting in death.

High concentrations of this gas mixture can cause an oxygen-deficient environment. Individuals breathing such an atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. Under some circumstances of overexposure, death may occur. It should be noted that before adverse health effects or suffocation could occur the effects of overexposure to Hydrogen Chloride will be felt.

**SKIN CONTACT:** Depending on the concentration and duration of overexposure, skin contact may lead to severe burns or dermatitis (red, cracked, irritated skin).

**OTHER HEALTH EFFECTS:** Repeated Hydrogen Chloride-overexposures by inhalation can result in erosion of teeth. Contact with rapidly expanding gases (which are released from under high pressure) may cause frostbite. Symptoms of frostbite include change in skin color to white or grayish-yellow. The pain caused by frostbite can quickly subside, masking the injury. In addition, the sudden release of a pressurized gas (such as may occur in the event of a valve failure), presents a severe hazard of mechanical injury.

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

**ROUTE OF ENTRY:** Inhalation, Skin Contact

**TARGET ORGANS:** Respiratory System, Eyes, Skin

**ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE (continued):**

**SYMPTOMS:** Dermatitis may result from repeated skin contact with this gas mixture. Repeated overexposures by inhalation can result in erosion of tooth enamel. Repeated over-exposure to a mixture that contains Hydrogen Chloride can result in emphysema.

**CARCINOGENIC POTENTIAL:** The components of this gas mixture are listed by agencies tracking the carcinogenic potential of chemical compounds, as follows:

**HYDROGEN CHLORIDE:** ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen); IARC-3 (Unclassifiable as to Human Carcinogenicity)

The remaining components are not found on the U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, IARC, or ACGIH Carcinogenicity lists and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

**TOXICITY DATA:** There are no specific toxicology data for Neon, Hydrogen or Helium. These gases are simple asphyxiants, which act to displace oxygen in the environment. The following toxicological data are available for Hydrogen Chloride.

<u>HYDROGEN CHLORIDE (Gas):</u>	<u>HYDROGEN CHLORIDE (Mist) / HYDROCHLORIC ACID (continued):</u>	<u>HYDROGEN CHLORIDE (Mist) / HYDROCHLORIC ACID (Continued):</u>
Inhalation-Rat LC <sub>50</sub> : 2810 ppm [D.O.T.]	Inhalation-Rat TCLo: 450 mg/m <sup>3</sup> /1 Hour (1 day pre):	Oral-Rabbit, adult LD <sub>50</sub> : 900 mg/kg
Inhalation-Rat LC <sub>50</sub> : 4701 ppm/30 minutes	Teratogenic effects	Unreported-Man LDLo: 81 mg/kg
Inhalation-Mouse LC <sub>50</sub> : 2644 ppm/30 minutes	Inhalation-Human LCLo: 1300 ppm/30 minutes	<b>Skin Effects:</b> Application of 0.5 mL of a 17% concentrated solution for 4 hours can cause corrosive burns.
<b>HYDROGEN CHLORIDE (Mist) /</b>	Inhalation-Human LCLo 3000 ppm/5 minutes	<b>Eye Effects:</b> Application of a 1% Hydrochloric Acid Solution for 20 seconds has caused scarring of the cornea. Other studies have reported that applications of 5 mg for 30 seconds caused mild irritation, and that application of a 5% solution caused minimal irritation.
<b>HYDROCHLORIC ACID:</b>	Inhalation-Rat LC <sub>50</sub> : 3124 ppm/1 hour	
Eye effects-Rabbit, adult 100 mg ms; Mild irritation effects	Inhalation-Rabbit, adult LCLo: 4416 ppm/30 minutes	
DNA Repair-Escherichia coli 25 µg/wel	Inhalation-Mouse LC50: 2644 ppm/30 minutes	
Cytogenetic Analysis-grasshopper-Parenteral 20 mg	Inhalation-Mouse LC50: 1108 ppm/1 hour	
Inhalation-Rat LC50: 4701 ppm/30 minutes	Intraperitoneal-Mouse LD50: 1449 mg/kg	

**IRRITANCY OF PRODUCT:** This gas mixture may be mildly to severely irritating to contaminated tissue, depending on the duration of contact.

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

**REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of the components of this gas mixture on the human reproductive system.

**Mutagenicity:** The components of this gas mixture are not reported to cause mutagenic effects in humans. The Hydrogen Chloride component has been reported to cause mutagenic effects in specific human 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.

*A **mutagen** is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An **embryotoxin** is a chemical that causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance that interferes in any way with the reproductive process.*

**BIOLOGICAL EXPOSURE INDICES (BEIs):** Currently, Biological Exposure Indices (BEIs) are not applicable for the components of this gas mixture.

**SECTION 12. ECOLOGICAL INFORMATION**

**ENVIRONMENTAL STABILITY:** Neon, Hydrogen and Helium occur naturally in the atmosphere and are stable. Hydrogen Chloride will fume in air to form hydrochloric acid, which will slowly biodegrade to other organic compounds.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Due to the corrosive and 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 currently available for Hydrogen Chloride:

Population size Reduction (*Chlorella pyrenoidosa* green algae) 1600 weeks = 800 µg/L

Residue (*Eichhornia crassipes* water hyacinth) 4-48 weeks = 1000 µg/L

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** The Hydrogen Chloride component of this gas mixture is very soluble in water, and even low concentrations of Hydrogen Chloride in water are detrimental to aquatic life. If a release this product occurs near a river or other body of water, the release has the potential to kill fish and other aquatic life. The following aquatic toxicity data are available for Hydrochloric Acid, which would be formed upon contact with water:

TLm (sunfish) = 96 hours/ pH 3.6/ 20 °C

TLm (goldfish) = 96 hours/ pH 4/ 20 °C

TLm (*Gambusia affinis*, mosquito fish) 96 hours = 282 ppm (fresh water)

TLm (stickleback) = 96 hours/ pH 4.6/ 20 °C

LC (*Lepomis macrochirus*, bluegill sunfish) 48 hours = 3.6 mg/L

LC<sub>50</sub> (shrimp) 48 hours = 100-330 ppm (salt water)

LC<sub>50</sub> (starfish) 48 hours = 100-300 mg/L/ 48 hours

LC<sub>50</sub> (cockle) = 330-1000 mg/L

LC<sub>50</sub> (*Carassium auratus*, goldfish) = 178 mg/L (1-2 hour survival time)

LC<sub>50</sub> (shore crab) 48 hours = 240 mg/L

LC<sub>50</sub> (*Lepomis macrochirus*/bluegill sunfish) 96 hours = pH 3.0-3.5

LC<sub>100</sub> (trout) 24 hours = 10 mg/L

**MOBILITY:** Neon, Hydrogen and Helium are inert and do not present a hazard of mobility. Hydrogen Chloride will fume to hydrochloric acid, which, especially in the presence of water, will be mobile in soil (the rate of infiltration will depend on the amount of water/moisture present in the soil).

**PERSISTENCE AND BIODEGRADABILITY:** Persistence: Neon, Hydrogen and Helium are natural elements and present no hazard of persistence. If spilled in soil, Hydrogen Chloride will convert to hydrochloric acid, which, as it moves through the soil, will dissolve soil materials, particularly if of carbonate base. The acid will be somewhat neutralized, but is expected to transport to the ground water table. In water, Hydrogen Chloride disassociates almost 100% with the hydrogen ion captured by the water molecules to form the hydronium ion. Biodegradation: All components of this gas mixture will biodegrade.

**POTENTIAL TO BIOACCUMULATE:** Neon, Hydrogen and Helium have no bio-accumulation potential. Hydrogen Chloride has the following BCF data:

BCF = 1000 m - 24 weeks (residue) for *Coccolithis sp* blue-green algae) 1E-6.5 M

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

**ENVIRONMENTAL EXPOSURE CONTROLS:** Controls should be engineered to prevent release to the environment, including procedures to prevent spills, atmospheric release and release to waterways.

**SECTION 13. DISPOSAL CONSIDERATIONS**

**UNUSED PRODUCT / EMPTY CONTAINER:** Do not dispose of unused product. Return used product in cylinders to: Spectra Gases, Inc., 80 Industrial Drive, Alpha, NJ 08865 or Spectra Gases, Inc., 1261 Activity Drive, Vista, CA 92083.

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

**SECTION 14. TRANSPORT INFORMATION****U.S. SHIPPING INFORMATION:**

**U.S. DOT PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Helium, Hydrogen Chloride) **or**  
(Neon, Hydrogen Chloride)

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

**UN IDENTIFICATION NUMBER:** UN 1956

**U.S. DOT 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 in a well-ventilated truck (never transport in passenger compartment of a vehicle). Ensure cylinder valve is properly closed, valve outlet cap 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 which 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**

**TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** This gas is classified 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 information is applicable.

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Helium, Hydrogen Chloride) **or**  
(Neon, Hydrogen Chloride)

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

**UN IDENTIFICATION NUMBER:** UN 1956

**PACKING GROUP:** Not Applicable

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

**SPECIAL PROVISIONS:** None

**EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX:** 0.125

<b>SECTION 14. TRANSPORT INFORMATION (Continued)</b>
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ERAP INDEX: None  
 PASSENGER CARRYING SHIP INDEX: None  
 PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX: 75

**INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA):**

**IATA DESIGNATION:** This gas is classified as dangerous goods, per the International Air Transport Association.

**UN IDENTIFICATION NUMBER:** UN 1956

**PROPER SHIPPING NAME/DESCRIPTION:** Compressed gas, n.o.s. (Helium, Hydrogen Chloride) *or*  
 (Neon, Hydrogen Chloride)

**HAZARD CLASS or DIVISION:** 2.2 (Non-Flammable Gas)

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

**PACKING GROUP:** None

**PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION:** 200

**PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG:** 75 kg

**PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY PACKING INSTRUCTION:** None

**PASSENGER and CARGO AIRCRAFT LIMITED QUANTITY MAXIMUM NET QUANTITY PER PKG:** None

**CARGO AIRCRAFT ONLY PACKING INSTRUCTION:** 200

**CARGO AIRCRAFT ONLY MAXIMUM NET QUANTITY PER PKG:** 150 kg

**SPECIAL PROVISIONS:** None

**ERG CODE:** 2L

**INTERNATIONAL MARITIME ORGANIZATION SHIPPING INFORMATION (IMO): IMO DESIGNATION:** This gas is classified as dangerous goods, per the International Maritime Organization.

**UN No.:** 1956

**PROPER SHIPPING NAME:** Compressed gas, n.o.s. (Helium, Hydrogen Chloride) *or*  
 (Neon, Hydrogen Chloride)

**HAZARD CLASS NUMBER:** 2.2

**PACKING GROUP:** None

**SPECIAL PROVISIONS:** None

**LIMITED QUANTITIES:** 120 mL

**PACKING INSTRUCTIONS:** P200

**EmS:** F-C, S-V

**STOWAGE CATEGORY:** Category A

**MARINE POLLUTANT:** The components of this gas mixture are not designated by the IMO to be Marine Pollutants.

**EUROPEAN SHIPPING INFORMATION:**

**EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD**

**(ADR):** This gas is classified by the Economic Commission for Europe to be dangerous goods. Additional information is as follows:

**UN NO.:** 1956

**NAME and DESCRIPTON:** Compressed gas, n.o.s. (Helium, Hydrogen Chloride) *or*  
 (Neon, Hydrogen Chloride)

**CLASS:** 2

**CLASSIFICATION CODE:** 2A

**PACKING GROUP:** Not Applicable

**LABELS:** 2.2

**SPECIAL PROVISIONS:** None

**LIMITED QUANTITIES:** LQ1

**PACKING INSTRUCTIONS:** P200

**MIXED PACKING PROVISIONS:** MP9

**HAZARD IDENTIFICATION No.:** 20

<b>SECTION 15. REGULATORY INFORMATION</b>
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**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): Hydrogen Chloride = 5000 pounds (2270 kg)  
 (Extremely Hazardous Substance)

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

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

Extremely Hazardous Substances: Helium, Hydrogen and Neon are not listed.  
 Hydrogen Chloride is listed.

Threshold Planning Quantity (TPQ): Hydrogen Chloride = 500 lb. (227.5 kg)  
 Reportable Quantity (RQ): Hydrogen Chloride = 5000 lb. (2270 kg)

**SECTION 15. REGULATORY INFORMATION (Continued)****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 Hydrogen Chloride require reporting under Section 313 (as hydrochloric acid).

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

Threshold Planning Quantity (TPQ): Hydrogen Chloride = 5000 lb. (2270 kg)

**TSCA:** Toxic Substances Control Act

The components of this gas mixture are listed on the TSCA Inventory.

**OSHA - OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION:****29 CFR Part 1910.119:** Process Safety Management of Highly Hazardous Chemicals.

Threshold Planning Quantity (TPQ): Hydrogen Chloride = 5000 lb. (2270 kg)

**U.S. STATE REGULATORY INFORMATION:****CALIFORNIA 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.**CANADIAN FEDERAL REGULATIONS (continued):****OTHER CANADIAN REGULATIONS:** This gas mixture would be categorized as a Controlled Product, Hazard Classes A, and D2B, as per the Controlled Product Regulations. The components of this gas mixture are not on the CEPA Priorities Substances Lists.**CANADIAN WHMIS SYMBOLS:** **Class A:** Compressed Gas**Class D2B:** Toxic Material/Materials Causing Other Toxic Effects**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:****EC LABELING AND CLASSIFICATION:** This product meets the following definition, per the European Community Council Directive 67/548/EEC.**EU CLASSIFICATION:** Xi (Irritant)**EU RISK PHRASES:** [R: 36/37/38]: Irritating to eyes, respiratory system and skin.**EU SAFETY PHRASES:** [S:(1/2)\*]: 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.* [S: 7/9]: Keep container tightly closed and in a well ventilated place. [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 36/37/39]: Wear suitable protective clothing, gloves and eye/face protection. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).**EU ANNEX II HAZARD SYMBOL:****EUROPEAN COMMUNITY INFORMATION FOR COMPONENTS:****HELIUM:****EU CLASSIFICATION:** An official classification for this substance has not been published in Commission Directives.**NEON:****EU CLASSIFICATION:** An official classification for this substance has not been published in Commission Directives.**HYDROGEN:** The following classification has been published in Commission Directives for Hydrogen Chloride.**EU CLASSIFICATION:** [F+]: Extremely Flammable**EU RISK PHRASES:** [R: 12]: Extremely flammable.**EU SAFETY PHRASES:** [S: 9]: Keep container in a well ventilated place. [S: 16]: Keep away from sources of ignition - No smoking. [S: 33]: Take precautionary measures against static discharges.**HYDROGEN CHLORIDE:** The following classification has been published in Commission Directives for Hydrogen Chloride.**EU CLASSIFICATION:** [T]: Toxic; [C]: Corrosive**EU RISK PHRASES:** [R: 23]: Toxic by inhalation. [R: 35]: Causes severe burns.**EU SAFETY PHRASES:** [S:(1/2)\*]: 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.* [S: 7/9]: Keep container tightly closed and in a well ventilated place. [S: 26]: In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. [S: 36/37/39]: Wear suitable protective clothing, gloves and eye/face protection. [S: 45]: In case of accident or if you feel unwell, seek medical advice immediately (show label where possible).

**SECTION 15. REGULATORY INFORMATION (Continued)****GLOBAL HARMONIZATION SYSTEM WARNINGS:****HAZARD CATEGORIES:**

Compressed Gas  
 Acute Toxicity Inhalation Category 4  
 Skin Corrosion/Irritation Category 2  
 Eye Damage/Irritation Category 2B  
 Specific Target Organ Systemic Toxicity (Single Exposure) Category 2  
 Specific Target Organ Systemic Toxicity (Repeated Exposure) Category 2  
 Warning

**SIGNAL WORDS:****HAZARD STATEMENTS:**

Contains gas under pressure; may explode if heated.  
 Harmful if inhaled.  
 Causes skin irritation.  
 Causes eye irritation.  
 May cause respiratory irritation.

**PREVENTION STATEMENTS:**

May cause damage to respiratory system by single exposure.  
 May cause damage to respiratory system by repeated exposure.  
 Do not eat, drink or smoke when using this gas. Wash hands thoroughly after using. Avoid breathing gas.  
 Obtain special instructions before use.  
 Use only outdoors or in a well-ventilated place. Avoid breathing gas.  
 Do not handle until all safety instructions have been read and understood.  
 Use personal protective equipment, as required.

**GLOBAL HARMONIZATION SYSTEM WARNINGS (continued):****STORAGE:**

Store locked-up.  
 Protect from sunlight and store in well-ventilated place. Keep valves tightly closed.

**RESPONSE STATEMENTS:**

If exposed or concerned: Get medical attention/advice.  
 If inhaled: remove to fresh air and keep at rest in a comfortable position for breathing. Call a Poison Center or doctor/physician if you feel unwell.  
 If irritation occurs, get medical advice/attention.  
 If in eyes, rinse with water cautiously for several minutes. Remove contact lenses if present and easy to do. Continue rinsing. If eye irritation persists, get medical advice/attention. Wash hands after handling.

**DISPOSAL STATEMENTS:**

Reclaim/recycle/dispose of contents and cylinder per local, regional, national and international regulations.

**SYMBOLS:****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.

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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11/25/08 update to new format; addition of GHS classification and symbol information; combined MSDS#1303 and 1304