



MATERIAL SAFETY DATA SHEET

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

SECTION 1. PRODUCT IDENTIFICATION

PRODUCT NAME: DEUTERIUM
CHEMICAL NAME: Deuterium
FORMULA: D₂
SYNONYMS: Heavy Hydrogen
U.S./MANUFACTURER: SPECTRA GASES, INC.
ADDRESS: 3434 Route 22 West
 Branchburg, NJ 08876, U.S.A.
PHONE: 908/252-9300
FAX: 908/252-0811
WEB SITE: www.spectra-gases.com
SPECTRA GASES EMERGENCY CONTACT: 800-932-0624 (U.S., Canada) 8:30 am - 7:00 pm (EST)
24 HOUR EMERGENCY CONTACT, CHEMTREC (24 hrs): 800/424-9300 (U.S., Canada, Puerto Rico)
 +1-703-527-3887 (International)

PRODUCT USE: Various

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 3. 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: F+ (Extremely Flammable)

EU RISK PHRASES: R: 12

EU SAFETY PHRASES: S: 2; S: 9; S: 16; S: 23

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

EMERGENCY OVERVIEW: Product Description: Deuterium is a colorless, odorless, flammable gas shipped under pressure. Deuterium is a stable isotope of hydrogen. **Health Hazards:** Deuterium can act as a simple asphyxiant by causing the displacement of oxygen to the extent that an oxygen deficient atmosphere may result. This hazard is secondary to the flammability hazard. **Flammability Hazards:** Deuterium is **highly flammable**. Gas cylinders under pressure may rupture when subject to high heat or flames. **Reactivity Hazards:** Deuterium can undergo a violent chemical reaction at elevated temperatures. **Environmental Hazards:** There are no data on the effects of this gas mixture to the environment. **Emergency Response Considerations:** Emergency responders must wear the proper personal protective equipment suitable for the situation to which they are responding. Provide adequate fire protection during emergency response situations.

SECTION 3. COMPOSITION and INFORMATION ON INGREDIENTS

(10,000 ppm = 1%)

CHEMICAL NAME	CAS #	EINECS#	Mole%	European Hazard Classification
				Risk Phrases Safety Phrases
Deuterium	7782-39-0	231-952-7	100%	HAZARD CLASSIFICATION: F+ [Extremely Flammable] RISK PHRASES: R: 12 SAFETY PHRASES: S: 2, S: 9, S: 16, S: 23

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

SECTION 4. FIRST AID MEASURES

THERMAL BURNS: In the event personnel are burned as a result of a release: For first degree burns or second degree burns with closed blisters -- flush area with cold water until pain subsides; apply loose, moist, sterile dressings, and bandage; treat for shock. For second degree burns with open blisters or third degree burns -- apply loose, dry, sterile dressings and bandage; treat for shock and transport victim immediately to hospital or emergency center. Burns over an area of 20% or more of body are life-threatening, medical attention should be immediately sought.

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.

SECTION 4. FIRST AID MEASURES (Continued)

SKIN CONTACT: 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.

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

SECTION 5. FIRE FIGHTING MEASURES

FLASH POINT: Flammable gas.

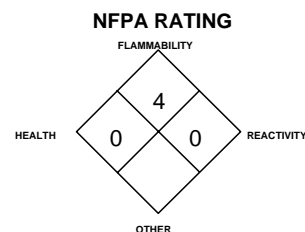
AUTOIGNITION: 585°C (1085°F)

FLAMMABLE RANGE: Lower (LEL): 5.0%; Upper (UEL): 75.0%

NFPA RATINGS:

HEALTH: = 0 FLAMMABILITY: = 4

REACTIVITY: = 0 SPECIAL: None



EXTINGUISHING MEDIA: Extinguish Deuterium fires by shutting-off the source of the gas.

Use water spray to cool fire-exposed containers, structures, and equipment.

EXTINGUISHING MEDIA NOT TO BE USED: Water will not be effective as an extinguishing agent. Water may spread fire. Contact with cold water can result in vigorous boiling.

SPECIAL FIRE-FIGHTING PROCEDURES: If possible, stop the flow of gas. The best fire-fighting technique may be simply to let the burning gas escape from the cylinder or pipeline. Stop the leak before extinguishing fire. If the fire is extinguished before the leak is sealed, the still-leaking gas could explosively re-ignite without warning and cause extensive damage, injury, or fatality. In this case, increase ventilation to prevent flammable or explosive mixture formation.

UNUSUAL FIRE AND EXPLOSION HAZARDS: An extreme explosion hazard exists in areas in which the gas has been released, but the material has not yet ignited. Deuterium is very light and will rise rapidly; particular attention should be given to upper portions of buildings where deuterium may "collect" to explosive levels. **Deuterium burns with an almost invisible blue flame.**

DANGER! Fires impinging (direct flame) on the outside surface of unprotected cylinders of Deuterium can be very dangerous. Exposure to fire could cause a catastrophic failure of the cylinder releasing the contents into a fireball and explosion of released gas. The resulting fire and explosion can result in severe equipment damage and personnel injury or death over a large area around the cylinder. For massive fires in large areas, use unmanned hose holder or monitor nozzles; if this is not possible, withdraw from area and allow fire to burn.

EXPLOSION SENSITIVITY TO MECHANICAL IMPACT: Not sensitive.

EXPLOSION SENSITIVITY TO STATIC DISCHARGE: Static discharge may cause this gas to ignite explosively. Due to low electrical conductivity, this substance can generate electrostatic charges during handling operations.

HAZARDOUS COMBUSTION PRODUCTS: None.

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.
- Eliminate possible sources of ignition.
- Deuterium is lighter than air and will dissipate if area is ventilated.
- Prior to re-entry, area should be monitored to ensure it has been cleared of flammable gas and that adequate levels of oxygen (>19.5%) are present.
- Contact your supplier if leak was from the cylinder, cylinder valve or the valve pressure relief device (PRD).

Notes for trained emergency responders:

Reference: Emergency Response Guidebook (Guide #115)

- Minimum Personal Protective Equipment should be **Level B: fire-retardant protective clothing, gloves and Self-Contained Breathing Apparatus.**
- Monitor area for combustible gas and oxygen levels. Combustible gas concentration must be below 10% of the LEL prior to entry.
- 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.
- Use only non-sparking tools and equipment during response.
- Attempt to close the main source valve prior to entering the area.
- Locate and seal the source of the leaking gas.
- Protect personnel attempting gas shut-off with water-spray.
- If it is not possible to stop release, allow remaining gas to release in-place or remove gas cylinder to a safe area, away from sources of ignition, and allow the gas to be released there.
- If leak is in user's gas handling equipment or system, close cylinder valve, and safely vent high pressure before attempting repairs.

SECTION 7. HANDLING AND STORAGE

STORAGE:

- Post "No Smoking or Open Flames" signs in use and storage areas. Have appropriate extinguishing equipment (i.e. sprinkler system, portable fire extinguishers). Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Flammable gas cylinders should be separated from oxygen cylinders, or other oxidizers, by a minimum distance of 20 ft. or equivalent.
- Isolate from incompatible chemicals (refer to Section 10, Stability and Reactivity).
- 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.
- Use only DOT or ASME code cylinders designed for compressed gas storage.

HANDLING:

- Consider use of flash arrestor on cylinders of Deuterium, due to extreme flammability.
- 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.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Relieve pressure before attempting repairs.

SPECIAL PRECAUTIONS: Work operations should be monitored in such a way that emergency personnel can be immediately contacted in the event of a release. 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*. Follow all local, state and federal regulations for storage of flammable gas.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Forced air, explosion-proof ventilation systems for the general work area should be provided to ensure Deuterium does not reach its lower flammability limit of 5.0%. If appropriate, install automatic monitoring equipment to detect the level of flammable gas.

EXPOSURE LIMITS:

OSHA PELs:	ACGIH TLVs:	NIOSH RELs:
There are no exposure limits for Deuterium, Deuterium is a simple asphyxiant.		

INTERNATIONAL OCCUPATIONAL EXPOSURE LIMITS: Currently there are no international exposure limits in place for Deuterium.

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 standard of Canada, or standards of EU member states. Please reference applicable regulations and standards for relevant details.

RESPIRATORY PROTECTION: Maintain oxygen levels above 19.5% in the workplace. Use supplied air respiratory protection if oxygen level is below 19.5%, 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 Canadian CSA Standard Z94.4-93, the European Standard EN 529:2005.

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. Eyewear should be as described in U.S. OSHA 29 CFR 1910.133, the European Standard CR 13464:1999 and the Canadian CSA Standard Z94.3-M1982, *Industrial Eye and Face Protectors*.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

SKIN PROTECTION: Work (such as leather) gloves are recommended when handling cylinders of this material. Wear gloves appropriate to the specific operation for which this gas mixture is used. Use triple gloves for spill response. If necessary, refer to U.S. OSHA 29 CFR 1910.138, and the European Standard CEN/TR 15419:2006, or appropriate Standards of Canada.

OTHER PROTECTIVE EQUIPMENT: Use body protection appropriate for task. Cotton or Nomex clothing is recommended to prevent static build-up. Safety shoes are recommended when handling cylinders. Transfer of large quantities under pressure may require fire-retardant clothing. Information on general protective measures can be found in U.S. OSHA 29 CFR 1910.136, 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

MOLECULAR WEIGHT: 4.032

GAS DENSITY @ 21.1°C (70°F): .010 lb/ft³ (0.17 kg/m³)

BOILING POINT @ 1 atm: -249.5°C (-417.1°F)

FREEZING/MELTING POINT @ 1 atm: -254°C (-425°F)

SPECIFIC GRAVITY (air = 1) @ 21.1°C (70°F): 0.139

SOLUBILITY IN WATER vol/vol at 20°C (68°F) and 1 atm: 0.019

SPECIFIC VOLUME @ 21.1°C (70°F): 95.9 ft³/lb (59.87 m³/kg)

CRITICAL PRESSURE (@ 16.43 atm ["Normal Deuterium"]): 241.5 psia (1664.8 kPa abs)

COEFFICIENT WATER/OIL DISTRIBUTION: Not applicable.

ODOR THRESHOLD: Deuterium is odorless.

APPEARANCE, ODOR AND STATE: Colorless, odorless gas.

WARNING PROPERTIES FOR THIS GAS: There are no warning properties in the event of a release. In terms of leak detection, fittings and joints can be painted with a soap solution to detect leaks, which will be indicated by a bubble formation.

SECTION 10. STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable.

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

MATERIALS WITH WHICH GAS IS INCOMPATIBLE: Deuterium is incompatible with strong oxidizer such as chlorine, bromine, pentafluoride, oxygen, oxygen difluoride and nitrogen trifluoride. Deuterium/Oxygen mixtures can explode on contact with a catalyst such as platinum.

REACTIVITY:

A) HAZARDOUS DECOMPOSITION PRODUCTS: None.

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 in which a release of Deuterium has occurred, they should be equipped with Self-Contained Breathing Apparatus (SCBA). Deuterium can act as a simple asphyxiant by causing the displacement of oxygen to the extent that an oxygen deficient atmosphere may result -- particularly if gas is released in poorly-ventilated areas (i.e., enclosed or confined spaces). (**Note:** Asphyxiation hazard is secondary to flammable hazard. If deuterium levels are high enough to create an oxygen deficient atmosphere, LEL has been reached and an explosive environment exists.) Acute overexposure to this gas may cause the following health effects:

EYE CONTACT: Release of a high-pressure gas may result in airborne objects.

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

INHALATION: Individuals breathing an oxygen-deficient atmosphere may experience symptoms which include headaches, ringing in ears, dizziness, drowsiness, unconsciousness, nausea, vomiting, and depression of all the senses. The skin of a victim may have a blue color. Under some circumstances of over-exposure, death may occur, due to the displacement of oxygen. The following effects associated with various levels of oxygen are as follows:

CONCENTRATION

of OXYGEN

20.9% Oxygen:

15-19% Oxygen:

12-15% Oxygen:

10-12% Oxygen:

Less than 10% Oxygen:

EXPOSURE SYMPTOM

Normal oxygen concentration in air.

Decreased ability to perform tasks. May impair coordination and may induce early symptoms in persons with heart, lung, or circulatory problems.

Breathing increases, especially in exertion. Pulse up. Impaired coordination, perception, and judgment.

Breathing further increases in rate and depth, poor coordination and judgment, lips slightly blue.

Mental failure, inability to perform various movements, loss of consciousness without warning, convulsions, death.

SKIN CONTACT: Not applicable.

OTHER HEALTH EFFECTS: 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.

SECTION 11. TOXICOLOGICAL INFORMATION (Continued)

ROUTES OF ENTRY, SYMPTOMS OF CHRONIC EXPOSURE:

ROUTE OF ENTRY: Not Applicable

TARGET ORGANS: None.

SYMPTOMS: None.

MEDICAL CONDITIONS AGGRAVATED BY OVEREXPOSURE: None are anticipated.

CARCINOGENICITY POTENTIAL: Deuterium is not found on the U.S. EPA, U.S. NTP, U.S. OSHA, U.S. NIOSH, GERMAN MAK, ACGIH or IARC Carcinogenicity lists and therefore is neither considered to be nor suspected to be a cancer-causing agent by these agencies.

TOXICITY DATA: There are no toxicology data for Deuterium. Deuterium is a simple asphyxiant that acts to displace oxygen in the environment.

IRRITANCY OF PRODUCT: Not applicable.

SENSITIZATION OF PRODUCT: Deuterium is not a sensitizer.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Deuterium on the human reproductive system.

Mutagenicity: Deuterium has not been found to cause mutagenic effects in humans.

Embryotoxicity: Deuterium has not been found to cause embryotoxic effects in humans.

Teratogenicity: Deuterium has not been found to cause teratogenic effects in humans.

Reproductive Toxicity: Deuterium has not been found 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 Deuterium.

SECTION 12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: Deuterium will be dissipated rapidly in well-ventilated areas.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Any adverse effect on plants would be related to oxygen-deficient environments or frost from rapidly expanding gases.

EFFECT OF CHEMICAL ON AQUATIC LIFE: There is currently no evidence of adverse effects from exposure to Deuterium on aquatic life.

MOBILITY: Deuterium is inert and does not present a hazard of mobility.

PERSISTENCE AND BIODEGRADABILITY: Persistence: Deuterium presents no hazard of persistence. Biodegradation: Not applicable.

POTENTIAL TO BIOACCUMULATE: Deuterium does not bioaccumulate.

OZONE-DEPLETION POTENTIAL: Deuterium is not a Class I or Class II ozone depleting chemical (40 CFR Part 82).

SECTION 13. DISPOSAL CONSIDERATIONS

UNUSED PRODUCT / EMPTY CONTAINER: Do not dispose of residual product. Return residual 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 users' system may be incinerated or safely released in a well-ventilated area. This 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. DOT SHIPPING INFORMATION:

U.S. DOT PROPER SHIPPING NAME: Deuterium, compressed

HAZARD CLASS NUMBER and DESCRIPTION: 2.1 (Flammable Gas)

UN IDENTIFICATION NUMBER: UN 1957

U.S. DOT SHIPPING LABEL(S) REQUIRED: Class 2.1 (Flammable Gas)

PLACARD (When required): Class 2.1 (Flammable)

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) #: 115

SECTION 14. TRANSPORT INFORMATION (Continued)
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CANADIAN SHIPPING INFORMATION/ 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:	Deuterium, compressed
HAZARD CLASS NUMBER and DESCRIPTION:	2.1 (Flammable Gas)
UN IDENTIFICATION NUMBER:	UN 1957
PACKING GROUP:	Not Applicable
HAZARD SHIPPING LABEL(S) REQUIRED:	Class 2.1 (Flammable Gas)
SPECIAL PROVISIONS:	38
EXPLOSIVE LIMIT & LIMITED QUANTITY INDEX:	0.125
ERAP INDEX:	3000
PASSENGER CARRYING SHIP INDEX:	Forbidden
PASSENGER CARRYING ROAD OR RAIL VEHICLE INDEX:	Forbidden

INTERNATIONAL AIR TRANSPORT ASSOCIATION SHIPPING INFORMATION (IATA): This gas is classified as dangerous goods, per the International Air Transport Association.

UN IDENTIFICATION NUMBER:	UN 1957
PROPER SHIPPING NAME/DESCRIPTION:	Deuterium, compressed
HAZARD CLASS or DIVISION:	2.1 (Flammable Gas)
HAZARD LABEL(S) REQUIRED:	Class 2.1 (Flammable Gas)
PACKING GROUP:	None
PASSENGER and CARGO AIRCRAFT PACKING INSTRUCTION:	Forbidden
PASSENGER and CARGO AIRCRAFT MAXIMUM NET QUANTITY PER PKG:	Forbidden
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:	A1 (see below)
ERG CODE:	10L

Special Provision A1: Under IATA regulations, Compressed Deuterium can only be shipped on passenger aircraft with the prior approval of appropriate authorities of the State of origin under the written conditions established by that authority. A copy of the document of approval, showing the quantity limitations and packing requirements, must accompany the consignment. The commodity may be carried on cargo aircraft in accordance with other provisions of IATA for the compound.

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

UN No.:	1957
PROPER SHIPPING NAME:	Deuterium, compressed
HAZARD CLASS NUMBER:	2.1
PACKING GROUP:	None
SPECIAL PROVISIONS:	None
LIMITED QUANTITIES:	None
PACKING INSTRUCTIONS:	P200
EmS:	F-D, S-U
STOWAGE CATEGORY:	Category E – Clear of Living Quarters
MARINE POLLUTANT:	Deuterium is not designated by the IMO to be a Marine Pollutant.

EUROPEAN AGREEMENT CONCERNING THE INTERNATIONAL CARRIAGE OF DANGEROUS GOODS BY ROAD (ADR): This gas is considered by the Economic Commission for Europe to be dangerous goods. Additional information is as follows:

UN NO.:	1957
NAME and DESCRIPTION:	Deuterium, compressed
CLASS:	2
CLASSIFICATION CODE:	1F
PACKING GROUP:	Not Applicable
LABELS:	2.1
SPECIAL PROVISIONS:	None
LIMITED QUANTITIES:	LQ0
PACKING INSTRUCTIONS:	P200
MIXED PACKING PROVISIONS:	MP9
HAZARD IDENTIFICATION No.:	23

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): Not Applicable

SARA TITLE III: Superfund Amendment and Reauthorization Act

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

Extremely Hazardous Substances: Deuterium is not listed.

Threshold Planning Quantity (TPQ): Not Applicable

Reportable Quantity (RQ): Not Applicable

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

IMMEDIATE HEALTH: No

PRESSURE: Yes

DELAYED HEALTH: No

REACTIVITY: No

FIRE: Yes

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

Releases of Deuterium do not require reporting under Section 313.

CLEAN AIR ACT:

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

Threshold Planning Quantity (TPQ): 10,000 lbs (4,553 kg)

TSCA: Toxic Substances Control Act

Deuterium is 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): 10,000 lbs (4,553 kg) [for all flammable gases, unless it is used as fuel]

NRC – Nuclear Regulatory Commission

Export of deuterium is regulated under 10 CFR Part 110 and may require a license from the UN NRC.

U.S. STATE REGULATORY INFORMATION:

CALIFORNIA PROPOSITION 65: Deuterium is not a listed substance which the State of California requires warning under this statute.

CANADIAN FEDERAL REGULATIONS:

CANADIAN DSL INVENTORY STATUS: Deuterium is listed on the Canadian DSL Inventory.

OTHER CANADIAN REGULATIONS: Deuterium is categorized as a Controlled Product, Hazard Classes A, and B1 as per the Controlled Product Regulations. Deuterium is not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS CLASSIFICATION: **Class A:** Compressed Gas; **Class B1:** Flammable Gas

**EUROPEAN UNION REGULATIONS:**

EU LABELING AND CLASSIFICATION: This gas is classified as hazardous, as per EU Commission Directives 93/72/EEC, 94/69 EC, or and 96/54/EC. The following is a self-classification.

EU CLASSIFICATION: F+ [Extremely Flammable]

EU RISK PHRASES: R: 12: [Extremely flammable.]

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: 9]: Keep container in a well-ventilated place. [S: 16]: Keep away from sources of ignition. [S: 33]: Take precautionary measures against static discharge-No smoking. [S: 46]: If swallowed, seek medical advice immediately and show this container or label.

EUROPEAN UNION ANNEX II HAZARD SYMBOL: F+ [Extremely Flammable]



SECTION 15. REGULATORY INFORMATION (Continued)

GLOBAL HARMONIZATION SYSTEM WARNINGS:

HAZARD CATEGORIES:	Extremely Flammable Gas Category 1 Compressed Gas
SIGNAL WORDS:	Danger
HAZARD STATEMENTS:	Extremely flammable gas. Contains gas under pressure; may explode if heated.
PREVENTION STATEMENTS:	Keep away from ignition sources such as heat/sparks/open flames. No smoking Do not eat, drink or smoke when using this gas. Wash hands thoroughly after using. Avoid breathing gas. Obtain special instructions before use.
STORAGE:	Use only outdoors or in a well-ventilated place. Avoid breathing gas. Store locked-up, protect from sunlight and store in well-ventilated place. Keep valves tightly closed. Do not handle until all safety precautions have been read and understood.
RESPONSE STATEMENTS:	Use personal protective equipment as required. Leaking gas fire: Do not extinguish unless leak can be stopped safely. Eliminate all ignition sources if safe to do so.
DISPOSAL STATEMENTS:	If exposed or concerned, get medical attention/advice. Reclaim/recycle/dispose of contents and cylinder per local, regional, national and international regulations.
SYMBOLS:	



SECTION 16. OTHER INFORMATION

Deuterium is usually generated commercially from deuterated water (D₂O). Some deuterated water ("heavy water") can contain levels of tritium that would cause it to be classified as radioactive.

Spectra Gases Inc., only sells (unless special arrangements are made) Deuterium with low tritium backgrounds. Spectra Gases' Deuterium gas is not classified as "radioactive".

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 Union 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. Or contact your Customer Service Representative.

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Revision History:

2/21/06 – Sec. 9 corrected gas density

5/12/08 – Sec 3

6/30/08: Up-date to current formats for ANSI and EU and addition of Global Harmonization info.