

# MATERIAL SAFETY DATA SHEET

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

## SECTION 1. PRODUCT IDENTIFICATION

**PRODUCT NAME:** DEUTERATED AMMONIA

**CHEMICAL FAMILY:** Nitrogen Deuteride

**FORMULA:** ND<sub>3</sub>

**SYNONYMS:** Ammonia-d3, Ammonia Deuteride, Heavy Ammonia

**MANUFACTURER:** SPECTRA GASES, INC.

**ADDRESS:** 3434 Route 22 West

Branchburg, NJ 08876, U.S.A.

**PHONE:** 908/252-9300

**FAX:** 908/252-0811

**SPECTRA GASES EMERGENCY CONTACT:** 908/454-7455 8:00 am - 5:00 pm

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

**DATE OF PREPARATION:** June 17, 1999

**MSDS NUMBER:** 1048

**PRODUCT USE:** Various

## SECTION 2. COMPOSITION and INFORMATION ON INGREDIENTS

**COMPOSITION:** Deuterated Ammonia 100%

**CAS NUMBER:** 13550-49-7

**EINECS NUMBER:** 236-926-9

**EXPOSURE LIMITS:** (10,000 ppm = 1%) The following exposure limits are for Ammonia, Anhydrous.

**OSHA PELs: ACGIH TLVs: NIOSH RELs:**

TWA = 50 TWA = 25 ppm TWA = 25 ppm

STEL = 35 STEL = 35 ppm STEL = 25

(1989 Vacated PEL) IDLH = 300 ppm

## SECTION 3. HAZARD IDENTIFICATION

**EMERGENCY OVERVIEW:** Deuterated Ammonia is a suffocating, pungent-smelling, toxic, liquefied, corrosive gas, which is shipped under pressure. This gas is lighter than air. Deuterated Ammonia is not readily ignited, but explosions of Deuterated Ammonia in confined spaces have been reported. Vapor clouds of the gas may be controlled using a water fog. Persons who respond to releases of this product must protect themselves from inhalation of the Deuterated Ammonia gases and mists, especially in areas which are downwind of the release. The odor of Deuterated Ammonia cannot be used as a reliable indication of a release as olfactory fatigue can occur. Extreme caution must be used when responding to releases.

**ROUTES OF ENTRY, SYMPTOMS OF ACUTE EXPOSURE: WARNING** - If rescue personnel need to enter an area suspected of having a toxic level of Deuterated Ammonia, they should be equipped with Self-Contained Breathing Apparatus (SCBA), and, if available, a full-body, chemically resistant suit. Acute overexposure to this gas may cause the following health effects:

**EYE CONTACT:** Contact of the gas or the mist produced by this product with the eyes can cause pain, redness, tearing, and burns. Severe exposure to the eyes may cause corneal ulceration, and symptoms resembling acute-angle closure glaucoma, and temporary blindness, leading to permanent vision impairment. Release of a high-pressure gas may result in airborne objects.

**INHALATION:** Inhalation of Deuterated Ammonia vapors or gases may lead to irritation of the nose and throat. Exposures to high concentrations of Deuterated Ammonia gas can lead to symptoms such as coughing, labored breathing, sore throat, and in some instances, chemical pneumonitis and pulmonary edema. High concentrations of Deuterated Ammonia gas may cause an oxygen deficient atmosphere. Additional symptoms can include, loss of smell, runny nose, vomiting, drooling, nausea, high blood pressure, headache, weakness, anxiety, restlessness, respiratory spasm, suffocation and lung damage. Exposure to high concentrations may cause unconsciousness, and under some circumstances, death.

## SECTION 3. HAZARD IDENTIFICATION (Continued)

**INHALATION (continued):** The symptoms associated with specific Deuterated Ammonia concentrations are as follows:

**Concentration Symptom(s)**

0.6 - 53 ppm Odor Threshold

25 - 50 ppm Irritation of the eyes and mucous membranes, which can be tolerated for several hours.

100 - 150 ppm Immediate irritation of the throat, which may be tolerated for an hour.

400 - 700 ppm Immediate, severe irritation of the respiratory system and eyes occurs.

> 5000 ppm This level of exposure may result in rapid death due to suffocation or fluid in the lungs. Exposure to concentrations in excess of 5000 ppm may cause laryngeal spasms, resulting in death.

**INGESTION:** Ingestion of Deuterated Ammonia in gaseous form is not a likely route of industrial exposure. If liquefied Deuterated Ammonia is ingested, damage to the tissues of the mouth, throat, esophagus, and other tissues of the digestive system may occur. Symptoms of ingestion can include burns, drooling, difficulty breathing, irregular heartbeat, low blood pressure, suffocation, kidney damage and shock. Ingestion of Deuterated Ammonia can be fatal. Additionally, aspiration by inhalation is possible, causing severe damage to the lungs, chemical pneumonia or death.

**SKIN CONTACT:** Contact of the gas or the mist produced by this product with the skin can lead to severe burns or dermatitis (red, cracked, irritated skin), depending upon concentration and duration of exposure.

**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.

**HMS RATINGS:** HEALTH: = 3; FLAMMABILITY: = 1; REACTIVITY: = 0;

**PPE:** Level H (see Section 8, Exposure Controls/Personal protective Equipment)

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

**ROUTE OF ENTRY:** Inhalation, skin and eye contact.

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

**SYMPTOMS:** Persistent irritation may result from repeated low level exposure to this gas. Repeated over-exposure to Deuterated Ammonia may result in emphysema. Prolonged exposure to the eyes could cause blindness. Repeated exposure of Deuterated Ammonia can result in dermatitis.

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

**CARCINOGENICITY:** Deuterated Ammonia is not found on the FEDERAL OSHA Z LIST, NTP, CAL/OSHA, or IARC Carcinogenicity lists and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

#### SECTION 4. FIRST AID MEASURES

**EYE CONTACT:** If this gas 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 15 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.

**INGESTION:** Ingestion is an unlikely route of exposure for the gaseous form of Deuterated Ammonia. DO NOT INDUCE VOMITING. CALL PHYSICIAN OR LOCAL POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If the victim vomits naturally, position victim to ensure that aspiration into the lungs does not occur.

**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 contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. 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.

#### SECTION 5. FIRE FIGHTING MEASURES

**FLASH POINT:** Not determined. Deuterated Ammonia can be ignited; see information below, on autoignition temperature.

**AUTOIGNITION:** 651° C (1204° F)

**FLAMMABLE RANGE:** Lower (LEL): 15.0% Upper (UEL): 28.0%

**NFPA RATINGS:**

HEALTH: = 3 FLAMMABILITY: = 1

REACTIVITY: = 0 SPECIAL: None

**EXTINGUISHING MEDIA:** Water Spray: YES Carbon Dioxide: YES

Foam: YES Dry Chemical: YES

Halon: YES Other: Any "ABC" Class.

**SPECIAL FIRE-FIGHTING PROCEDURES:** In the event of fire, cool containers of this product with water to prevent failure. Use a water spray or fog to reduce or direct vapors. Do not direct a water spray at the source of a release.

**UNUSUAL FIRE AND EXPLOSION HAZARDS:** This gas may ignite explosively, if released near an active fire. Deuterated Ammonia is lighter than air, but conditions associated with a release can cause it to accumulate in low-lying areas. 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:** There is insufficient information to classify Deuterated Ammonia as to its sensitivity to static discharge.

**HAZARDOUS COMBUSTION PRODUCTS:** Toxic combustion products of Deuterated Ammonia include oxides of nitrogen.

#### SECTION 6. ACCIDENTAL RELEASE MEASURES

**FIRST RESPONSE:** In the event of a leak of this product, operator should close the gas source, if possible to do so safely. Evacuate immediate area. In the event of a significant release from a single cylinder, the North American Response Guidebook (Guidebook #115) recommends 100 feet initial isolation from release.

Large releases of Deuterated Ammonia will be evident by the cloud of ammonia hydroxide mist formed. If a small leak is suspected, detected by smell or monitoring, the system should be purged and an inert gas should be used to determine location of the leak.

**TRAINED RESPONSE TEAM:** Personal Protective Equipment should include chemically resistant suit, gloves, and Self-Contained Breathing Apparatus (SCBA). Fire-retardant clothing may be considered in event of large release. Eliminate sources of ignition. A water fog or mist can be used to control the vapor cloud resulting from the release. Do not direct a water spray directly at the source of release. Allow the gas, which is lighter than air, to dissipate. Any supplemental ventilation should be explosion-proof equipment.

**ENTRY TO AREA:** Monitor the surrounding area for toxic gas level. (Note that Deuterated Ammonia gas is lighter than air). Deuterated Ammonia levels should be below the limits shown in Section 2 (Composition and Information on Ingredients), before personnel are allowed in the area without Self-Contained Breathing Apparatus.

**REPAIR/FOLLOW-UP:** If leak was in user's gas handling equipment or system, ensure cylinder is closed, system is purged and all high pressure is vented before attempting repairs. If leak was from the cylinder, cylinder valve or the valve pressure relief device (PRD), contact your supplier.

**THIS IS A TOXIC, CORROSIVE GAS.** Protection of all personnel and the area must be maintained. All responders must be adequately protected from exposure.

## 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. 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. **NOTE:** Use only DOT or ASME code cylinders designed for compressed gas storage. Cylinders must not be recharged except by or with the consent of owner.

**HANDLING:** This gas can be dangerous and should only be handled by trained personnel. Wearing contact lenses is not recommended when handling this gas. Spectra Gases, Inc., strongly recommends that this gas only be handled in areas with extensive venting capabilities, preferably a gas handling cabinet. Monitoring may be considered for areas in which this gas is used. Detection of Deuterated Ammonia should trigger immediate response and corrective action. Contaminated clothing should be removed and laundered separately before reuse.

## SECTION 7. HANDLING AND STORAGE (Continued)

**MATERIALS OF CONSTRUCTION:** Most common metals are not effected by dry Deuterated Ammonia. However, when combined with water vapor, ammonia will attack copper, zinc or alloys containing copper as a major alloying element, and therefore, these materials should not be used in construction of Deuterated Ammonia handling equipment. DOT regulations prohibit the use of copper, zinc, silver or alloys of these materials in the construction of containers for Deuterated Ammonia that are used in its shipment. Use non-sparking ventilation systems, approved explosion-proof equipment, and appropriate electrical systems. Electrical equipment used in gas-handling operations, or located in storage areas, should be non-sparking or explosion-proof. If leaks develop in Deuterated Ammonia lines, they must be given prompt attention because they will become progressively worse.

**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). Care should be taken to inspect the following valve locations for corrosion: neck (where valve inserts into cylinder); bonnet nut (where handle attaches to valve body). Close valve after each use and when empty. The failure of a valve can result in violent release of the pressurized gas, creating a severe mechanical injury hazard.

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 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.

**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.

**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. Systems should be corrosion-proof and explosion-proof. Employee exposure should be monitored and reduced to the lowest practical levels using ventilation or other appropriate engineering controls.

**RESPIRATORY PROTECTION:** Maintain exposure levels of Deuterated Ammonia below the levels listed in Section 2 (Composition / Information on Ingredients). Use supplied air respiratory protection if Deuterated Ammonia 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 EN149, and EC member states. The following guidelines, based on NIOSH respiratory protection recommendations, are for Ammonia, Anhydrous.

### Concentration RESPIRATORY EQUIPMENT

#### of AMMONIA

Up to 250 ppm Supplied Air Respirator (SAR)

Up to 500 ppm Supplied Air Respirator operated in continuous-flow mode, or a Powered Air Purifying Respirator (PAPR) with Ammonia cartridges, or a gas mask with a Ammonia canister, or a SCBA.

Emergency or Planned Entry into Unknown Concentration or IDLH Conditions: Positive-pressure, full facepiece SCBA or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

Escape Gas mask or mouth-piece respirator with Ammonia cartridges or SCBA should be used.

**EYE PROTECTION:** Use approved safety goggles or safety glasses, with a face-shield, as described in OSHA 29 CFR 1910.133 or by the European Standard EN166. Eye wash stations/safety showers should be available.

**RESPIRATORY PROTECTION (continued): SKIN PROTECTION:** Work (such as leather) gloves are recommended when handling cylinders of this gas. Use appropriate gloves for spill response.

## SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION (Continued)

**OTHER PROTECTIVE EQUIPMENT:** Use body protection appropriate for task. An apron, or other impermeable body protection is suggested. Safety shoes are recommended when handling cylinders. Full-body chemical protective clothing is recommended for emergency response procedures.

## SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

**MOLECULAR WEIGHT:** 20.054

**GAS DENSITY @ 21.1° C (70° F):** 0.0519 lb/ft<sup>3</sup> (0.831 kg/m<sup>3</sup>)

**BOILING POINT @ 1 atm:** -30.9°C (-23.62°F)

**FREEZING/MELTING POINT @ 1 atm:** -78°C (-108°F)

**SPECIFIC GRAVITY (air = 1) @ 25°C (77°F):** 0.5970

**SOLUBILITY IN WATER vol/liq @ 15.5° C (68° F):** Soluble.

**SPECIFIC VOLUME @ 0° C (32° F):** 22.6 lb/ft<sup>3</sup> (1.452 kg/ m<sup>3</sup>)

**CRITICAL PRESSURE:** 113 bar

**COEFFICIENT WATER/OIL DISTRIBUTION:** Not applicable.

**ODOR THRESHOLD:** 0.6 - 53 ppm (detection) [for Ammonia, Anhydrous]

**VAPOR PRESSURE @ 21.1° C (70° F):** 114.1 psig (786.7 kPa) [for Ammonia, Anhydrous]

**APPEARANCE, ODOR AND STATE:** Deuterated Ammonia is a suffocating, pungent-smelling, toxic, corrosive, liquefied gas. This gas is lighter than air and fumes strongly in moist air, producing a cloud of ammonium hydroxide mist.

**WARNING PROPERTIES FOR THIS GAS:** The odor of Deuterated Ammonia cannot be relied upon for detection of this gas, as olfactory fatigue can occur. The dense appearance of this gas may act as a warning property when released.

## 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:** Deuterated Ammonia is not compatible with most metals, acids, oxidizers. Deuterated Ammonia can form explosive compounds with mercury, gold or silver compounds or the elements. Deuterated Ammonia reacts violently with telluriumtetra bromide and tetrachloride, chlorine, bromine, fluorine, or the interhalogen compounds, and with acid halides, ethylene oxide, and hypochlorites (including household bleach). Poisoning or death can occur if Deuterated Ammonia (or ammonia-containing products) are mixed with household bleach.

**REACTIVITY:**

**A) HAZARDOUS DECOMPOSITION PRODUCTS:** Deuterated Ammonia does not decompose, but reacts with water to form ammonium hydroxide.

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

## SECTION 11. TOXICOLOGICAL INFORMATION

**TOXICITY DATA:** The following toxicological data are available for Ammonia, Anhydrous.

D.O.T. LC<sub>50</sub> = 4000 ppm

D.O.T. LC<sub>50</sub> = 7338 ppm

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

**CARCINOGENICITY:** Deuterated Ammonia has not been found to be carcinogenic.

**IRRITANCY OF PRODUCT:** Deuterated Ammonia is severely irritating to contaminated tissue.

**SENSITIZATION OF PRODUCT:** Deuterated Ammonia is not known to be a sensitizer upon prolonged or repeated contact.

**REPRODUCTIVE TOXICITY INFORMATION:** Listed below is information concerning the effects of Ammonia, Anhydrous on the human reproductive system.

**Mutagenicity:** This gas is not expected to cause mutagenic effects in humans. Ammonia, Anhydrous has been reported to cause mutagenic effects in microorganisms during experimental studies with exposures at relatively high doses.

**Embryotoxicity:** This gas is not expected to cause embryotoxic effects in humans.

**Teratogenicity:** This gas is not expected to cause teratogenic effects in humans.

**Reproductive Toxicity:** This gas is not expected to cause adverse reproductive effects in humans.

## SECTION 11. TOXICOLOGICAL INFORMATION (Continued)

*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 Deuterated Ammonia.

## SECTION 12. ECOLOGICAL INFORMATION

**ENVIRONMENTAL STABILITY:** Deuterated Ammonia is stable in the environment. All work practices should be aimed at eliminating environmental contamination.

**EFFECT OF MATERIAL ON PLANTS or ANIMALS:** Due to the corrosive and toxic nature of this gas, 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.

**EFFECT OF CHEMICAL ON AQUATIC LIFE:** Release of Deuterated Ammonia to an aquatic environment can be detrimental to aquatic life. If a large release 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 Ammonia, Anhydrous:

LC (goldfish, yellow perch) = 2.0-2.5 ppm/1-4 days  
LC<sub>100</sub> (crayfish) = 60-80 ppm/3 days  
TL<sub>78</sub> (fathead minnow) = 8.2 ppm/96 hours  
LC<sub>50</sub> (coho salmon) = 0.45 mg/L/96 hours  
LC<sub>50</sub> (guppy fry) = 1.2-74 mg/L/72 hours  
LC<sub>50</sub> (cutthroat trout fry, *Salmo clarki*) = 0.5-0.8 mg/L/96 hours  
LC<sub>50</sub> (rainbow trout: fertilized egg, alevins (0-50 days old), fry (85 days old), adults) = >3.58, >3.58, 0.068, 0.097 mg/L/24 hours  
LC<sub>50</sub> (walking catfish) = 0.28 mg/L/48 hours  
LC<sub>50</sub> (*Salmo trutta*) = >0.15 mg/L, 0.6-0.9 mg/L / 18 hours, 96 hours  
LC<sub>50</sub> (*Salvelinus fontinalis*) = 0.96-1.05 mg/L, 96 hours  
LC<sub>50</sub> (*Catostomus platyrhynchus*) = 0.67-0.82 mg/L, 96 hours  
LC<sub>50</sub> (*Oimephales promelas*) = 0.73-3.4 mg/L, 96 hours  
LC<sub>50</sub> (*Catostomus commersoni*) = 0.79-1.4 mg/L, 96 hours  
LC<sub>50</sub> (*Lepomis macrochirus*) = 0.26-4.6 mg/L, 96 hours  
LC<sub>50</sub> (*Lepomis macrochirus*) = 0.024-2.3 mg/L, 48 hours  
LC<sub>50</sub> (*Micropterus salmoides*) = >0.21-1.7 mg/L, 96 hours  
LC<sub>50</sub> (*Notropis lutrensis*) = 0.9-1.1 mg/L, 96 hours  
LC<sub>50</sub> (*Mugil cephalus*) = 1.2-2.4 mg/L, 96 hours  
LC<sub>50</sub> (*Morone americana*) = 0.52-2.13 mg/L, 96 hours  
LC<sub>50</sub> (*Notropis spilopterus*) = 1.2-1.35 mg/L, 96 hours  
LC<sub>50</sub> (*Lepomis cyanellus*) = 0.6-2.1 mg/L, 96 hours  
LC<sub>50</sub> (*Lepomis gibbosus*) = 0.14-0.86 mg/L, 96 hours

**MOBILITY:** As an ammonium compound, Deuterated Ammonia is strongly absorbed on soil, on sediment particles and colloids in water. This absorption results in high concentrations of sorbed ammonia in oxidized sediments. Under anoxic conditions, the absorptive capacity of sediments is less, resulting in the release of Deuterated Ammonia to either the water column or to an oxidized sediment layer above.

**PERSISTENCE AND BIODEGRADABILITY:** Persistence: In the atmosphere, it is theorized that Ammonia compounds combine with sulfate ion in the atmosphere or in washout by rainfall, resulting in a rapid return of Ammonia to the soil. In the soil and water, Deuterated Ammonia will biodegrade and not persist. Biodegradation: As an ammonia compound, Deuterated Ammonia rapidly converts to nitrate by nitrification, in an aquatic environment. Bacteria convert the ammonia to nitrate, creating an oxygen demand (BOD) several days after introduction of Deuterated Ammonia to the environment. Temperature, oxygen supply and pH of the water are factors in determining the rate of biodegradation.

**POTENTIAL TO BIOACCUMULATE:** Plants have a high affinity for gaseous Ammonia when leaf stomata are open in daylight. No data are currently available on this gas related to bioaccumulation in animals.

**OZONE-DEPLETION POTENTIAL:** Deuterated Ammonia 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 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 EC member states.

### SECTION 14. TRANSPORT INFORMATION

**U.S. SHIPPING INFORMATION:** The following information is for U.S. domestic shipments only.

**PROPER SHIPPING NAME:** Ammonia, anhydrous, liquefied

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

**UN IDENTIFICATION NUMBER:** UN 1005

**PACKING GROUP:** Not applicable.

**DOT LABEL(S) REQUIRED:** 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) #:** 125

**CANADIAN SHIPPING INFORMATION:**

**TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS:** This gas is considered as dangerous goods. Use the following for the preparation of Canadian Shipments.

**PROPER SHIPPING NAME:** Ammonia, anhydrous, liquefied

**HAZARD CLASS NUMBER and DESCRIPTION:** 2.4 (Corrosive Gas)

9.2 (Substance hazardous to the environment)

**UN IDENTIFICATION NUMBER:** UN 1005

**PACKING GROUP:** Not applicable.

**HAZARD LABEL(S) REQUIRED:** Primary Hazard: Toxic Gas

Subsidiary Hazard: Corrosive

**NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996):** 125

**SPECIAL PROVISION:** 102 (Poison-Inhalation Hazard) 109 Emergency Response Assistance Planning requirements must be met for shipments in excess of 5 kg or liters. Placards on trucks must be changed at the border.

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

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

**PROPER SHIPPING NAME:** Ammonia, anhydrous

**HAZARD CLASS NUMBER and DESCRIPTION:** 2.3 (Toxic Gas)

**UN IDENTIFICATION NUMBER:** UN 1005

**HAZARD LABEL(S) REQUIRED:** Primary Hazard: Toxic Gas

Subsidiary Hazard: Corrosive

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
IIII	IIII	Forbidden	200
			25 kg

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

**IMO DESIGNATION:** This gas is considered as dangerous goods, per the International Maritime Organization.

**PROPER SHIPPING NAME:** Ammonia, anhydrous

**HAZARD CLASS NUMBER and DESCRIPTION:** 2.3 (Toxic Gas)

**UN IDENTIFICATION NUMBER:** UN 1005

**HAZARD LABEL(S) REQUIRED:** Primary Hazard: Toxic Gas

Subsidiary Hazard: Corrosive

**IMDG CODE:** Page 2104

**STOWAGE CATEGORY:** Category D - Clear of Living Quarters "Separated from" Chlorine.

**MARINE POLLUTANT:** Ammonia, Anhydrous is not designated by the IMO to be a Marine Pollutant.

**SECTION 14. TRANSPORT INFORMATION (Continued)**

**EUROPEAN SHIPPING INFORMATION:**

**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:

**SUBSTANCE IDENTIFICATION NO.:** 1005

**NAME OF SUBSTANCE:** Ammonia, anhydrous

**HAZARD IDENTIFICATION NO.:** 268

**LABEL:** 6.1 + 8

**CLASS AND ITEM NUMBER:** 2, 1° TC

**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): Ammonia, Anhydrous = 100 lb. (45.4 kg)

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

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

Ammonia, Anhydrous is listed.

Threshold Planning Quantity (TPQ): Ammonia, Anhydrous = 500 lb. (227.5 kg)

Reportable Quantity (RQ): Ammonia, Anhydrous = 100 lb. (45.4 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 Ammonia, Anhydrous 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): Ammonia, Anhydrous = 10,000 lb. (4544 kg); However, Ammonia when used as an agricultural nutrient, and when held by farmers, is exempt from all provisions of this regulation.

**TSCA:** Toxic Substances Control Act

Ammonia, Anhydrous 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): Ammonia, Anhydrous = 10,000 lb. (4544 kg)

**U.S. STATE REGULATORY INFORMATION:**

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

Ammonia, Anhydrous is listed by the following State regulations (more specific regulations exist in some States):

Alaska - Designated Toxic and Hazardous Substances: Ammonia, Anhydrous.

California - Permissible Exposure Limits for Chemical Contaminants: Ammonia, Anhydrous.

Florida - Substance List: Ammonia, Anhydrous.

Illinois - Toxic Substance List: Ammonia, Anhydrous.

Kansas - Section 302/313 List: Ammonia, Anhydrous.

Massachusetts - Substance List: Ammonia, Anhydrous.

Michigan - Critical Materials Register: No.

Minnesota - List of Hazardous Substances: Ammonia, Anhydrous.

Missouri - Employer Information/Toxic Substance List: Ammonia, Anhydrous.

New Jersey - Right to Know Hazardous Substance List: Ammonia, Anhydrous.

North Dakota - List of Hazardous Chemicals, Reportable Quantities: Ammonia, Anhydrous.

Pennsylvania - Hazardous Substance List: Ammonia, Anhydrous.

Rhode Island - Hazardous Substance List: Ammonia, Anhydrous.

Texas - Hazardous Substance List: Ammonia, Anhydrous.

West Virginia - Hazardous Substance List: Ammonia, Anhydrous.

Wisconsin - Toxic and Hazardous Substances: Ammonia, Anhydrous.

**CANADIAN FEDERAL REGULATIONS:**

**CANADIAN DSL INVENTORY STATUS:** Ammonia, Anhydrous is listed on the Canadian DSL Inventory.

**OTHER CANADIAN REGULATIONS:** Ammonia, Anhydrous would be categorized as a Controlled Product, Hazard Classes A, and E, as per the Controlled Product Regulations. This gas is not on the CEPA Priorities Substances Lists.

## SECTION 15. REGULATORY INFORMATION (Continued)

**CANADIAN FEDERAL REGULATIONS (continued):**

**CANADIAN WHMIS SYMBOLS: Class A:** Compressed Gas

**Class E:** Corrosive Material

**EUROPEAN ECONOMIC COMMUNITY REGULATIONS:**

**EC Labeling and Classification:** Ammonia, Anhydrous is classified, per the European Community Council Directive 67/548/EEC.



**EUROPEAN:** **EC** is the European Community (formerly known as the **EEC**, European Economic Community). **EINECS:** This is the European Inventory of Now-Existing Chemical Substances. The **ARD** is the European Agreement Concerning the International Carriage of Dangerous Goods by Road and the **RID** are the International Regulations Concerning