Material Safety Data Sheet for:
Deuterated Ammonia (ND₃)

In an emergency, call CHEMTREC at 800-424-9300 or 703-527-3887.

**Section 1: Chemical Product and Company Identification**

**Material Name:** Deuterated Ammonia  
**Chemical Formula:** ND₃

**Synonyms:** Ammonia-d₃; Perdeuterated ammonia; Perdeuteroammonia; Perdeuteroammonia; Trideuterated ammonia; Trideuteroammonia

**Manufacturer:** Voltaix, LLC  
Post Office Box 5357, North Branch, New Jersey 08876-5357, USA  
Voice: 908-231-9060 or 800-VOLTAIX, Facsimile: 908-231-9063

This MSDS is Copyrighted, Voltaix, 2011. Permission is hereby granted to duplicate it, in its entirety, for distribution with this material.

**Section 2: Composition/Information on Ingredients**

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS Registry Number</th>
<th>Concentration</th>
<th>Exposure Guidelines</th>
</tr>
</thead>
<tbody>
<tr>
<td>Deuterated Ammonia</td>
<td>13550-49-7</td>
<td>100%</td>
<td>25 ppm TLV-TWA (NIOSH)</td>
</tr>
</tbody>
</table>

**Section 3: Hazards Identification**

**EMERGENCY OVERVIEW**

**DANGER! TOXIC, CORROSIVE, FLAMMABLE.**

Deuterated Ammonia is a toxic, corrosive gas with an intense pungent odor. Deuterated Ammonia is harmful if inhaled. May cause suffocation, dizziness and drowsiness. May cause eye, skin and respiratory tract damage. As exposure deadens the sense of smell, do not use smell to determine Deuterated Ammonia concentration.

**NFPA 704 Rating (NFPA 49-1991):**  
Health: 3  Fire: 1  Reactivity: 0  Special: None

**Potential Health Effects**

**Routes of Exposure:**  
Inhalation, Eye, Skin adsorption.

**Lengths of Exposure:**  
Prolonged exposure may cause irritation.

**Severity of Effect:**  
Depends on concentration and duration.

**Target Organs:**  
Sense organs, eyes, respiratory system.

**Type of Effect:**  
Corrosive to all tissues contacted. Prolonged or repeated exposures may cause ulcerated nasal septum, flaccid paralysis without anesthesia, change in trachea or bronchi.

**Signs and Symptoms of Exposure:**  
Burning sensation, coughing, wheezing, laryngitis.

**Medical Conditions that may be Aggravated by Exposure:**  
Inhalation may aggravate asthma and inflammatory or fibrotic pulmonary disease. Skin contact may aggravate existing dermatitis.

**Reported Carcinogenic and Reproductive Effects:**
NTP has not reported genetic or long-term toxicology and carcinogenesis effects studies.

Section 4: First Aid Measures

Inhalation
This is the primary route of exposure.

1) Remove the affected person from the gas source or contaminated area. Note: Personal Protective Equipment (PPE), including positive pressure, self-contained breathing apparatus, may be required to assure the safety of the rescuer.

2) If the affected person is not breathing spontaneously, administer rescue breathing.

3) If the affected person does not have a pulse, administer CPR.

4) If medical oxygen and appropriately trained personnel are available, administer 100% oxygen to the affected person.

5) Summon an emergency ambulance. If an ambulance is not available, contact a physician, hospital, or poison control center for instruction.

6) Keep the affected person warm, comfortable, and at rest while awaiting professional medical care. Monitor the breathing and pulse continuously. Administer rescue breathing or CPR if necessary.

Skin Contact
Flush with a copious stream of water while removing contaminated clothing. Continue flushing until the professional medical assistance arrives, but for no less than fifteen minutes. Assume that the airway may also have been injured and obtain professional medical assistance immediately. The effects of skin exposure may be delayed.

Eye Contact
Flush continuously with clean water until the professional medical assistance arrives, but for no less than thirty minutes. Continuation of flushing until patient is transferred to an ophthalmologist or emergency physician is recommended. Assume the patient has also been exposed by inhalation and obtain professional medical assistance immediately.

Ingestion
Ingestion is not an observed route of exposure to gaseous hazardous materials.

Chronic Effects
None is known to Voltaix.

Note to Physicians:
Victims of overexposure may experience delayed onset of pulmonary edema at least 72 hours post exposure. Pulmonary edema may follow chemical bronchitis. Supportive treatment with necessary ventilation actions, including oxygen, may warrant consideration. Primary hazard is irritation on the skin and mucosal surfaces.

Section 5: Fire Fighting Measures

Flammability and Explosivity

Flash Point:
11°C

Flammability Limits in Air (% by volume):
Upper: 28% Lower: 15%

Autoignition Temperature:
651°C (1204°F)

Flammability Classification (per 29 CFR 1910.1200):
Flammable gas.

**Known or Anticipated Hazardous Products of Combustion:**
Oxides of nitrogen

**Properties that may Initiate or Intensify Fire:**
Heating cylinder to the point of activating the pressure relief device.

**Reactions that Release Flammable Gases:**
None known or suspected.

**Extinguishing Media**
None. Do not extinguish if flow cannot be shut off immediately. Water spray/fog nozzle to keep cylinder cool.

**Fire Fighting Instructions**
Cool the cylinder and surroundings with water from a suitable distance.

Excessive pressure may develop in gas cylinders exposed to fire, which may result in explosion, regardless of the cylinder's content. Cylinders with pressure relief devices (PRD's) may release their contents through such devices if the cylinder is exposed to fire. Cylinders without PRD's have no provision for controlled release and are therefore more likely to explode if exposed to fire.

Positive pressure, self contained breathing apparatus is required for all fire fighting involving hazardous materials. Full structural fire fighting (bunker) gear is the *minimum* acceptable attire. The need for proximity, entry, and flashover protection and special protective clothing should be determined for each incident by a competent fire fighting safety professional.

**Section 6: Accidental Release Measures**

**Containment**
This material is a gas at atmospheric conditions. The only means of containment is the enclosure of the space into which the material is released. Such containment is described in Section 7.

**Clean Up**
Clean up consists of passing the entire gas volume of the enclosure through appropriate exhaust gas treatment equipment (EGTE). Purge the enclosure with a non-reactive gas, such as nitrogen, through the EGTE until an acceptably low level of contamination remains. Equipment contaminated by this material must then be cleaned or decommissioned appropriately.

**Evacuation**
If the release is not contained in an appropriate device or system, all personnel not appropriately protected (see Section 8) must evacuate the contaminated spaces. Consider evacuation of additional areas, as a precaution against the spread of the release.

**Special Instructions**
Water used for cleanup may be contaminated. The discharge of such compounds to the sewer system or the environment may be restricted, requiring the containment and proper disposal of the water.

**Section 7: Handling and Storage**

**Handling**
Handle this material only in sealed, purged systems. The design of handling systems for hazardous materials is beyond the scope of this MSDS, and should be performed by a competent, experienced professional. Consider the use of doubly-contained piping; diaphragm or bellows sealed, soft seat valves; backflow prevention devices; flash arrestors; and flow monitoring or limiting devices. Gas cabinets, with appropriate exhaust treatment, are recommended, as is automatic monitoring of the secondary enclosures and work areas for release.

Handle sealed gas cylinders in accordance with CGA P-1, *Safe Handling of Compressed Gases in Containers*. 
Some material may have accumulated behind the outlet plug. Face the outlet away from you and wear appropriate protective equipment when removing the plug to connect the cylinder to your system.

Never introduce any substance into a gas cylinder. If you believe your cylinder may have been contaminated, notify Voltaix immediately. Provide as much information as possible on the nature and quantity of contamination.

Storage
Store cylinders in accordance with CGA P-1, Safe Handling of Compressed Gases in Containers, local building and fire codes and other relevant regulations. Materials should be segregated, by the hazards they comprise, for storage.

Protect the cylinders from direct sunlight, precipitation, mechanical damage, and temperatures above 55 °C (130 °F).

Ship and store cylinders with the outlet plug and valve protective cap in place.

Section 8: Exposure Control/Personal Protection

Engineering Controls
Local exhaust is required. Secondary containment, with appropriate exhaust gas treatment, is strongly encouraged and is required in some jurisdictions. Ensure that eyewash stations and safety showers are close to the workstation location.

Monitor the work area and the secondary containment continuously for release of the material. Automatic alerting of personnel and automatic shutdown of flow are appropriate in most applications and are required in some jurisdictions.

Purge all primary containment systems with a nonreactive gas, such as nitrogen, before introducing Deuterated Ammonia.

Personal Protective Equipment (PPE)
Respiratory Protection:
Positive pressure, full face, air supplied breathing apparatus should be used for work within the secondary containment equipment if a leak is suspected or the primary containment is to be opened, e.g., for a cylinder change. Air supplied breathing apparatus is required for response to demonstrated or suspected releases from the primary containment.

Eye/Face Protection:
When using respiratory protection as described above, use a face mask that provides splash and impact protection for the face and eyes. For handling sealed cylinders, wear safety glasses.

Skin Protection:
Wear appropriate gloves when handling sealed cylinders. Use gloves and other skin protection, as assigned by a competent safety professional, when working within the secondary enclosure with the primary enclosure compromised, e.g., cylinder changing, to protect from exposure to the material. For response to demonstrated or suspected releases from the primary containment, the need for whole-body exposure protection should be determined by a competent safety professional.

Other Protection:
Wear appropriate protective footwear when moving cylinders. Select per OSHA 29CFR1901.132 and 1910.133.

Exposure Guidelines

<table>
<thead>
<tr>
<th>ACGIH</th>
<th>OSHA</th>
<th>NIOSH</th>
</tr>
</thead>
<tbody>
<tr>
<td>TLV-TWA</td>
<td>TLV-STEL</td>
<td>PEL-TWA</td>
</tr>
<tr>
<td>Ammonia, Anhydrous</td>
<td>25 ppm</td>
<td>35 ppm</td>
</tr>
</tbody>
</table>

Section 9: Physical and Chemical Properties
Material Safety Data Sheet for: Deuterated Ammonia (ND₃)

In an emergency, call CHEMTREC at 800-424-9300 or 703-527-3887.

Notes: 1) "N/A" means not applicable.
2) Unless otherwise specified, properties are reported at 0 °C (32 °F) and 1 atmosphere (1.0 bar, 14.7 psia).

<table>
<thead>
<tr>
<th>Property</th>
<th>Deuterated Ammonia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Extremely pungent</td>
</tr>
<tr>
<td>Physical state at atmospheric conditions</td>
<td>gas</td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>4802 mmHg at 15.5 °C (59.9 °C)</td>
</tr>
<tr>
<td>Vapor Density</td>
<td>0.69 g/L</td>
</tr>
<tr>
<td>Boiling point (at 1 atm)</td>
<td>-33 °C (-27.4 °F)</td>
</tr>
<tr>
<td>Melting point</td>
<td>-78 °C (-108.4 °F)</td>
</tr>
<tr>
<td>Solubility in water (v/v)</td>
<td>Soluble</td>
</tr>
<tr>
<td>Specific gravity of liquid (water = 1)</td>
<td>0.771 at 0 °C (32 °F)</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>20.05</td>
</tr>
</tbody>
</table>

**Section 10: Stability and Reactivity**

**Chemical Stability:**
Stable.

**Conditions to Avoid:**
Reacts with zinc, copper, tin, and their alloys, heat, moisture.

**Incompatibility with Other Materials:**
Halogens, acids, acid chloride, acid anhydrides, oxidizing agents, chloroformates, galvanized iron.

**Hazardous Decomposition, Reaction and Oxidation (other than burning) Products:**
Ammonia, nitrogen oxides.

**Hazardous Polymerization:**
Not reported to occur.

**Section 11: Toxicological Information**

**Acute Data (by route):**
Based on Anhydrous Ammonia, harmful by inhalation, ingestion, skin absorption. Extremely destructive to tissue of mucous membranes, upper respiratory tract eyes and skin. Inhalation may be fatal as a result of spasm, inflammation and edema.

Inhalation, rat: LC₅₀ (1hr) = 7338 ppm.
Oral, rat: LD₅₀ = 350 mg/kg

**Chronic and Subchronic Data:**
No data is available on deuterated ammonia. Ammonia, Anhydrous is listed in the Registry of Toxic Effects of Chemical Substances (RTECS), but no information on its carcinogenicity is available.

**Special Studies:**
None known to Voltaix.

**Section 12: Ecological Information**

MSDS Number: A001 Revised: 28 March 2011
Ecotoxicity:
None known to Voltaix.

Environmental Fate:
None known to Voltaix.

Section 13: Disposal Considerations

Classification under RCRA, 40 CFR 261:
Not Listed.

US EPA waste number and descriptions:
None.

Special Instructions and Limitations:
Treat process and other exhaust streams appropriately before release to the atmosphere.

Notice:
The information above is derived from Voltaix’s interpretation of the US federal laws, regulations and policies concerning the material, as shipped by Voltaix, at the time this MSDS was prepared. Federal controls are subject to change and state and local controls may also apply. Proper waste disposal is the responsibility of the owner of the waste. The user is encouraged to consult with appropriate experts in developing a disposal plan.

Section 14: Transport Information

Basic Description:
Ground, Domestic: Ammonia, Anhydrous, Division 2.2 (8) (Nonflammable Gas, Corrosive), UN 1005
International: Ammonia, Anhydrous, Division 2.3 (8) (Toxic Gas, Corrosive), UN 1005
Note: Corrosive and Toxic labels required.

Additional Information for shipment by water:
IMDG Page Number 2178.

Additional Information for shipment by air:
Air transportation by cargo and passenger aircraft is prohibited.

Section 15: Regulatory Information

TSCA Status:
This material is not listed on the Inventory of Chemical Substances. This material is supplied under the "Exemption for Research and Development" (40 CFR 720.36) of the Toxic Substances Control Act. As such, its use is restricted to R&D purposes and must be "by, or directly under the supervision of, a technically qualified individual," as defined by 40 CFR 720.3(ee). Use for "commercial purposes", which EPA defines, in part, as "the purpose of obtaining an immediate or eventual commercial advantage" (40 CFR 720.3(r)), is prohibited.

CERCLA Reportable Quantity (40CFR302.4):
These materials are not listed. The Final Rule Reportable Quantity (RQ) for Ammonia is 45.4 kg (100 lb).

SARA Title III Status (Section 302 (40CFR355), Section 311/312, Section 313 (40CFR372)):
No Threshold Planning Quantity (TPQ) or Reportable Quantity (RQ) is listed for these substances.
40CFR355 lists Ammonia as an Extremely Hazardous Substance with a Threshold Planning Quantity (TPQ) of 227 kg (500 lbs.) and a Reportable Quantity (RQ) of 45.4 kg (100 lb).
SARA Title III Section 311/312: Hazardous categories: Acute: Yes; Chronic: No; Fire: No; Reactive: No; Sudden Release: Yes.
Ammonia is listed in 40CFR372.
The default federal MSDS submission and inventory requirement filing threshold of 4,540 kg (10,000 lbs.) may also apply.

*Note:* State and local requirements may be more stringent.

### Section 16: Other Information

**References**


**Revision Indication**

- New 01 February 2005
- Revision 21 July 2006 – updated company name
- Revision 28 March 2011 – updated format and transportation section

**Disclaimer**

Voltaix cannot guarantee that these are the only hazards that exist. Users are solely responsible for the safe storage, handling, use and disposal of this material, and for compliance with the applicable laws, regulations and accepted practices.

Voltaix makes no representations or warranties, either expressed or implied, of merchantability, fitness for a particular purpose, or any other nature.