Anhydrous Ammonia: Product Identification

Trade Name: Anhydrous Ammonia
Synonyms: Liquid Ammonia; R-Grade (Refrigeration Grade), Commercial Grade, Agricultural Grade; 82-0-0.
Chemical Family: Liquefied gas, Inert
Chemical I.D. No.: UN1005; STCC # 4904210
Chemical Formula: NH₃
DOT Hazard Class: 2.2
Label Required:

INHALATION HAZARD

ANHYDROUS AMMONIA

QT or NQT RQ

Anhydrous Ammonia: Composition

<table>
<thead>
<tr>
<th>Ingredients</th>
<th>CAS #</th>
<th>Wt%</th>
<th>OSHA PEL¹</th>
<th>ACGIH STEL²</th>
<th>NIOSH IDLH¹</th>
<th>ACGIH TLV³</th>
<th>Units</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anhydrous Ammonia</td>
<td>7664-41-7</td>
<td>99.5 - 100.0</td>
<td>50</td>
<td>35</td>
<td>300</td>
<td>25</td>
<td>ppm</td>
</tr>
</tbody>
</table>

¹ = Permissible Exposure Limit (8-Hr. Time Weighted Average).
² = Short Term Exposure Limit (15 Minute Exposure).
³ = Immediately Dangerous to Life and Health.
⁴ = Threshold Limit Value (8-Hr. Time Weighted Average).
N.A. = Not Available

Anhydrous Ammonia: NFPA Code

3 Health Hazard (Blue):
Can cause injury despite medical treatment.

1 Flammability Hazard (Red):
Ignites after considerable preheating.

0 Reactivity Hazard (Yellow):
Normally stable. Not reactive with water.

NONE Special Notice (White):
None listed.
Anhydrous Ammonia: **Physical and Chemical Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling Point:</td>
<td>-28°F (-33°C) @ 1 Atmosphere</td>
</tr>
<tr>
<td>Vapor Pressure:</td>
<td>124 psia @ 68°F (20°C)</td>
</tr>
<tr>
<td>Solubility in H₂O:</td>
<td>51g / 100g @ 68°F (20°C)</td>
</tr>
<tr>
<td>Specific Gravity:</td>
<td>5.15 lb/gal @ 68°F (20°C) (0.62 g/cc)</td>
</tr>
<tr>
<td>Volatile by Volume:</td>
<td>100%</td>
</tr>
<tr>
<td>Vapor Density:</td>
<td>0.6 (air = 1.0)</td>
</tr>
<tr>
<td>Odor:</td>
<td>Pungent and extremely irritating odor</td>
</tr>
<tr>
<td>Appearance:</td>
<td>Colorless liquefied gas</td>
</tr>
</tbody>
</table>

N.A. (Not Available)

Anhydrous Ammonia: **Fire and Explosion Data**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flash Point:</td>
<td>Not flammable under conditions typically encountered.</td>
</tr>
<tr>
<td>Flammable Limits in Air %/Vol.</td>
<td>Lower: 16.0%, Upper: 25.0%</td>
</tr>
<tr>
<td>Autoignition Temperature:</td>
<td>1,204°F (651°C)</td>
</tr>
<tr>
<td>Extinguishing Media:</td>
<td>Water fog is best. (Ammonia will react with Carbon Dioxide to form a dense white cloud).</td>
</tr>
</tbody>
</table>

**Special Fire Fighting Procedure:**

Use water spray or fog to keep fire-exposed containers cool. Do not completely extinguish flame unless gas flow is shut off! Ammonia burns to form oxides of nitrogen. Firefighters should wear self-contained breathing apparatus and full protective clothing.

**Unusual Fire or Explosion Data:**

Although classified nonflammable, Ammonia does have an explosive range. Ammonia can be a dangerous fire and explosion hazard when mixed with air.

Anhydrous Ammonia: **Reactivity Data**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability:</td>
<td>Stable</td>
</tr>
<tr>
<td>Hazardous Polymerization:</td>
<td>Will not occur.</td>
</tr>
<tr>
<td>Conditions to avoid /Incompatibility:</td>
<td>Acids, strong oxidizing agents, chlorine, bromine, pentafluoride, nitrogen trifluoride, mercury, silver oxide, calcium, and chlorides of iron. Do not use copper, brass, bronze, or galvanized steel in ammonia service.</td>
</tr>
<tr>
<td>Hazardous Decomposition Products:</td>
<td>Ammonia and oxides of Nitrogen (Nitrogen Dioxide, Nitric Oxide).</td>
</tr>
</tbody>
</table>
Anhydrous Ammonia: Health Hazard Data

Carcinogenicity:
- NTP: NO
- IARC Monographs: NO
- OSHA Regulated: NO

Occupational Exposure Limits:

- OSHA Permissible Exposure Limit (PEL): 50 ppm for an 8 hour Time Weighted Average.
- ACGIH Short-term Exposure Limit (STEL): 35 ppm for 15 minutes Short Term Exposure Limit.
- NIOSH Immediately Dangerous to Life and Health (IDLH): 300 ppm is immediately dangerous.
- ACGIH Threshold Limit Value (TLV-TWA): 25 ppm for an 8 hour Time Weighted Average.

Acute Effects of Overexposure:

- Eyes: Contact may cause corrosion, pain, redness and ulceration of the cornea, lens and conjunctiva.
- Skin: Contact can cause frostbite, freeze burns and/or chemical burns, resulting in severe dermal damage.
- Inhalation: The gas is extremely irritating to mucous membranes and lung tissue. Coughing, chest pain, and difficulty in breathing may result. Prolonged exposure may result in bronchitis, pulmonary edema, and chemical pneumonitis. Breathing high concentrations may result in death.
- Ingestion: Extremely irritating to mucous membranes causing vomiting, nausea and burns.

Chronic Effects of Overexposure:

No chronic health effects have been found to date.

Additional Medical and Toxicological Information:

May aggravate preexisting pulmonary, lung, or eye conditions.

Anhydrous Ammonia: Emergency First Aid Procedures

- Eye contact: Immediately flush with large amounts of water, including under the eyelids. Seek medical attention immediately, preferably an Ophthalmologist. Speed and thoroughness in rinsing eyes are important to avoid permanent injury.
- Skin Contact: Immediately flush with large amounts of tepid water while removing clothing. Thaw frozen clothing before removal. If a freeze burn has occurred, get medical attention.
- Inhalation: Remove promptly to fresh air. If breathing has stopped, apply artificial respiration. Apply oxygen as soon as possible. Seek medical attention immediately.
- Ingestion: Do not induce vomiting. Rinse mouth out with water. Drink large amounts of water or milk. Seek medical attention immediately.
**Anhydrous Ammonia: Special Protection Information**

**Eye Protection:** Ammonia is severely corrosive to mucosal membranes (eyes, nose, throat). Remove contact lenses and wear chemical goggles. A face shield is also advised for additional skin protection where contact with liquid or vapor may occur.

**Skin Protection:** Ammonia is severely corrosive to epidermal tissue. Wearing nonporous clothing: pants, sleeves, footwear, and gloves is the recommended protection against skin contact.

**Inhalation:** Use approved full face respiratory protective equipment when concentrations of gaseous ammonia are greater than STEL. SCBA is required to contain a liquid leak, upon entry into buildings and entry into designated confined space areas, or in any situations where airborne concentrations may exceed occupational exposure limits.

**Ventilation:** Provide adequate general and local exhaust ventilation to attain occupational exposure limits, to prevent the formation of explosive atmospheres; and to prevent the formation of an oxygen deficient atmosphere, particularly in a confined space area.

**Anhydrous Ammonia: Spill or Leak**

**Spill Procedures:** Remove sources of heat or ignition, including internal combustion engines and power tools. Keep people away. Stay upwind and warn people downwind of possible exposure. Wear self-contained breathing apparatus if condition warrants.


**Anhydrous Ammonia: Waste Disposal**

**Procedure:** Anhydrous Ammonia will not leave residue when spilled; no chemical clean-up will be required. Vegetation, insects, reptiles, fish and small mammals contacted by liquid Ammonia and/or the vapor cloud will likely die; post spill conservation measures may be required.

**Anhydrous Ammonia: Special Precautions and Comments**

**Storage Precautions:** Store cylinders and tanks in a well ventilated area, away from incompatible materials (i.e. Chlorine), sources of heat and ignition. Empty containers may contain residual gas and can be dangerous. Ground or bond all lines and equipment used for the transfer and storage of ammonia gas to prevent static sparks. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, flames, sparks or other sources of ignition; they may explode and cause injury or death.

Consult the Compressed Gas Association publications:

(G-2) “Anhydrous Ammonia”

(G-2.1) “American National Standard Safety Requirements for the Storage and Handling of Anhydrous Ammonia. ANSI K61.1”
Anhydrous Ammonia: EPA SARA Title III Information

EPCRA Section 311/312 Hazard Categorization:

<table>
<thead>
<tr>
<th></th>
<th>Acute</th>
<th>Chronic</th>
<th>Fire</th>
<th>Pressure</th>
<th>Reactive</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

Note: Ammonia does not have a fire danger in accordance with the EPCRA definition but Ammonia will explode under optimum conditions.

EPCRA & CAA Hazardous Substances:

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS No.</th>
<th>% / wt.</th>
<th>CAA 112(r)</th>
<th>302 TPQ lb.</th>
<th>304 RQ lb.</th>
<th>313 TRI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ammonia</td>
<td>7664-41-7</td>
<td>&gt;99</td>
<td>10,000 lb</td>
<td>500</td>
<td>100</td>
<td>X</td>
</tr>
</tbody>
</table>

Key: CAA 112(r) = Toxic Substance with potential for airborne release
Sec. 302 TPQ = Extremely Hazardous Substances (EHS) Threshold Planning Quantity
Sec. 304 RQ = EHS and CERCLA Reportable Quantity if spilled
Sec. 313 TRI = Toxic Chemicals to be reported on Toxic Release Inventory if spilled

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