



Material Safety Data Sheet

Anhydrous Ammonia

MSDS Name:	Anhydrous Ammonia
Trade Name	AMMONIA
Synonyms:	Anhydrous Ammonia, Liquefied ammonia, Ammonia
Chemical Name	AMMONIA
Chemical Formula	NH3
Chemical Family	Alkali
Material Uses	Agricultural industry: Fertilizer. Industrial applications: Manufacture of chemicals, synthetic fibers, cleaning solutions, and specialty fertilizers.

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Section 2: Hazardous Identification

Hazardous INgredient	wt%
Ammonia	99.5 – 99.8

Ammonia gas or liquid is very corrosive to body tissues, reacting with body moisture on contact.

Inhalation: The odour recognition threshold for ammonia ranges from 0.7 PPM for persons with an acute sense of smell to over 50 PPM for acclimatized individuals. Generally, concentrations of up to 25 PPM are tolerated although unpleasant and pungent. Above this concentration, irritation of the eyes, nose and throat may begin. The extent of irritation increases with increasing ammonia concentration, and decreases with acclimatization NIOSH has established 300 PPM as the concentration immediately dangerous to life and health (IDLH), which is defined as the concentration above which self-rescue may be difficult or impossible due to physiological effects. At concentrations above 1000 PPM increasing chest tightness, bronchospasm and severe eye and skin irritation may result. Delayed effects such as chemical pneumonitis and pulmonary edema may develop several hours after exposure.

Exposure to high concentrations (5,000 ppm) may cause death. Effects may be more pronounced at lower concentrations in children, the elderly, and persons with impaired lung function

Eyes: Exposure to high gas concentrations may cause temporary or permanent eye damage. Direct contact of the eyes with liquid ammonia will produce serious eye burns. Excessive exposure to gaseous or liquid ammonia may result in permanent blindness

Skin: Contact with liquid or high concentrations of gas may cause severe skin irritation, chemical burns, and blistering. Contact with vaporizing liquid may cause frostbite due to rapid evaporative cooling. Cooling effect may mask the extent of the corrosive injury received.

Ingestion: Ingestion is not a likely route of exposure due to the physical state of the substance (a compressed, liquefied gas). CARCINOGENIC EFFECTS: NONE by ACGIH, EPA, IARC, OSHA. MUTAGENIC EFFECTS: NONE by ACGIH, EPA, IARC, OSHA. TERATOGENIC EFFECTS: NONE by ACGIH, EPA, IARC, OSHA. The substance is harmful to the lungs and mucous membranes. Repeated or prolonged exposure to the substance can produce target organ damage. Sub-acute and chronic exposures to concentrations of 100-200 ppm may result in eye irritation while concentrations of 200-1000 ppm may produce eye damage. POTENTIAL CHRONIC HEALTH EFFECTS POTENTIAL ACUTE HEALTH EFFECTS



SECTION 3: First Aid Measures:

EYE CONTACT / SKIN CONTACT: Immediately flush eyes with water for 60 minutes or longer keeping eyelids open. Obtain immediate medical attention. Continue to flush eyes, if possible, while transporting to medical care. Dermal contact may freeze tissue and cause severe skin irritation or chemical burns. Immediately flush with water for a minimum of 60 minutes while removing contaminated clothing. Obtain immediate medical attention. Continue to flush, if possible, while being transported to medical care.

INHALATION: Loosen tight clothing. Allow to rest in a well ventilated area. Give artificial respiration if breathing has stopped. Obtain immediate medical attention.

If gases or vapors are present, rescuers must wear self-contained breathing apparatus and an impervious (Level A) encapsulating suit if subject to US OSHA requirements. (29CFR 1910.120 has been deemed to overrule the lesser protection requirements given in 1910.111) In other jurisdictions or if responding under D.O.T. rules (49CFR) full bunker gear or Level B clothing may suffice.

Evacuate affected persons to a safe area as soon as possible. Loosen tight clothing around the neck and waist. If the person is not breathing, perform artificial respiration. If breathing is difficult, administer oxygen. Maintain an open airway. Obtain immediate medical attention. Observation may be warranted. Pulmonary edema may occur several hours after exposure.

INGESTION: If anhydrous ammonia has entered the mouth or throat, begin resuscitation or artificial respiration avoiding mouth to mouth contact and continue until the person is breathing.

Administer oxygen if available.

Do not induce vomiting. Quickly transport the person to an emergency care facility. Removal of the substance from the stomach must be done by medical personnel. If tolerated, give no more than 1 cup of milk or water to rinse the mouth and throat and dilute the stomach contents. No more than 8 ounces (1 cup) in adults and 4 ounces (1/2 cup) in children is recommended to minimize the risk of vomiting. If spontaneous vomiting does occur, lower the head so that the vomit will not reenter the mouth and throat. Rinse mouth with water.

Section 4. Fire and Explosion Data

The product is Combustible. Product will burn with difficulty if kept between the LEL of 16% and UEL of 25%. This gas is generally regarded as non-flammable due to the difficulty of ignition. However, the presence of oil or other combustible materials will increase the fire hazard, and may ignite with explosive force under favorable conditions. Nitrogen oxides (NO, NO₂).

Auto-ignition temperature	651.1°C (1204°F)
Products of combustion	Not applicable
Flash point	Material exists as a gas unless confined under pressure
Flammability limits	LOWER: 16% UPPER: 25%
Fire hazard in the presence of various Substances	May ignite in the presence of open flames and sparks. Narrow lower to upper flammability limits (16-25%) makes ignition difficult but not impossible. The presence of oil or other combustible materials will increase the fire hazard.
Explosion hazard in the presence of various substances	Slightly explosive in the presence of reducing materials (hypochlorites or other halogenated compounds). Ammonia is not readily ignited but a mixture of ammonia and air will explode when ignited under favorable conditions
Fire fighting media and instructions	Corrosive. If gases or vapours are present, rescuers must wear self-contained breathing apparatus and an impervious (Level A) encapsulating suit if subject to US OSHA requirements. (29CFR 1910.120 has been deemed to overrule the lesser protection requirements given in 1910.111) In other jurisdictions or if responding under D.O.T. rules (49CFR) full bunker gear or Level B clothing may suffice.



Approach from Upwind	If anhydrous ammonia catches fire, stop flow of gas or liquid if it may be done safely. Cool containing vessels with water in order to prevent pressure build-up
Autoignition or Explosion	Move containing vessels from fire if without risk. Use water fog to suppress vapors. Do not direct water into spilled ammonia. Ammonia is a cryogenic liquid which will cool with evaporation thereby limiting vapour release. Fire water at supply temperature will increase liquid ammonia's temperature resulting in greater evaporation. Contain run-off water for treatment.
Hazardous Combustion Products:	Nitrogen oxides
EXPLOSION HAZARDS	Explosive when mixed with chlorinated materials such as hypochlorites. Will form nitrogen trichloride which explodes spontaneously in air. Ammonia reacts similarly with other halogenated materials
FIRE HAZARDS	When heated to decomposition it emits toxic fumes

Section 5. Accidental Release Measures

SMALL SPILL: Warn personnel to move away. Keep unprotected personnel upwind of spill area. Do not approach liquid or vapor cloud without encapsulating suit and SCBA. If possible to do so without hazard, isolate leak by shutting off supply of ammonia from containing vessel. Use water fog to suppress airborne vapors from leak or spill.

Do not direct water into spilled liquid! Anhydrous ammonia will autorefrigerate reducing vapor release. Addition of water will warm cryogenic liquid resulting in greater gasification. Contain run-off water for later recovery and treatment. Call emergency number on this MSDS sheet for assistance.

LARGE SPILL:

- Stay indoors (unless evacuation has been called by local authorities)
- Close all windows and doors, seal with duct tape or wet towels
- Shut off furnace, exhaust fans, fireplaces, and air conditioners
- Wait for and follow advice from local police or authorities
- If smell is very strong, breath through a wet cloth

PRECAUTIONS Keep ammonia handling facilities and containers locked. Protect against physical damage. Keep storage vessels away from direct heat. Ground all equipment. Keep away from incompatible materials such as oxidizing agents, reducing agents, metals, and acids. Keep children away from ammonia storage and handling equipment.

Section 6. Handling and Storage

STORAGE: Keep away from combustible materials, heat, and incompatible materials, especially dry or liquid bleach. Ensure facilities are well maintained and emergency response and first aid equipment is readily available. Always ensure there is a nearby source of water for first aid purposes and spill response.

Handling: Facilities storing or handling ammonia should be equipped with an eyewash and safety shower, or other equipment for emergency decontamination



Section 7. Exposure Controls/Personal Protection

ENGINEERING CONTROLS Workers must be trained in the safe handling and use of ammonia. Adequate, well engineered systems must be provided for storage, transfer and use. Process block valves, equipment enclosures and other isolation facilities may be necessary. Provide adequate general or local exhaust systems to maintain concentrations within exposure guidelines.

PERSONAL PROTECTION	The selection of personal protective equipment varies, depending upon conditions of use.
Respiratory Protection:	Use a NIOSH approved chemical cartridge respirator with full facepiece for ammonia concentrations up to 300 PPM. Use a positive pressure (pressure demand) SCBA for concentrations above 300 PPM, for emergency response, or for entry into unknown concentrations
Eye Protection	Contact lenses should not be worn when handling anhydrous ammonia. Use chemical goggles and a face shield or full facepiece air purifying or air supplied respirator.
Skin Protection	Where chemical contact is unlikely, wear butyl rubber, nitrile, or polyvinyl chloride boots, gloves, rain jacket and pants
EXPOSURE LIMITS	ACGIH TLV-TWA: 25 ppm, TLV-STEL: 35 ppm. ALBERTA OEL: TWA: 25 ppm, STEL: 35 ppm U.S. OSHA PEL:8H TWA 50 ppm (35 mg/m3) NIOSH REL, AMMONIA in air:10H TWA25 ppm;STEL 35ppm; IDLH 300 ppm

Section 8. Physical and Chemical Properties

Physical State	cryogenic liquid or gas
Appearance	Colourless liquid or gas
Molecular Weight	17.03
Ph (10% SOLN/WATER)	12
Boiling Point	-33.35°C (-28°F)
Melting Point	-77.7°C (-107.9°F)
Critical Temperature	Not available
SPECIFIC GRAVITY G/Cc	0.62 (Water = 1)
Bulk Density	
KG/M3:	620 kg/m3;
LBS/Ft3	5.04 lbs/gal (US
Color	Colorless
Odor	Ammoniacal. (Strong.) ODOR -17 ppm (recognition
Volatility	100% (w/w).
Solubility	Easily soluble in cold or hot water
Dispersion	See solubility in water, methanol
Vapor Pressure	125 psi at 68°F (20°C)
Water/Oil Dist.	The product is more soluble in
Coeff	water
Vapor Density	0.6 (Air = 1)

Section 9. Stability and Reactivity Data

Stability	The product is stable
Instability Temperature	Not available
Conditions Of Instability	No additional information
Incompatibility With	Extremely reactive or incompatible with acids. Highly reactive with oxidizing agents and VARIOUS SUBSTANCES reducing agents. Do not use copper, brass, bronze, or galvanized steel in contact with ammonia. Do not use brazed joints in ammonia service. Forms explosive compounds with many heavy metals such as mercury or silver. Reacts explosively with chlorine, hypochlorites (such as bleach or dry chlorinating chemicals) and other halogens (bromine, iodine, fluorine).
Corrosivity	Highly corrosive to copper and its alloys. Slightly corrosive to aluminum and zinc. Very slightly corrosive to mild steel. Non-corrosive to glass or stainless steel (304 or 316).



Section 10. Toxicological Information

ECOTOXICITY Hazardous for humans or animal	Ammonia acts as a fertilizer to promote plant growth. Under aerobic conditions ammonia will oxidize to nitrate and is neither persistent nor bioaccumulative in the environment
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Section 11. Ecological Information

Aquatic Toxicity	Ammonia is a toxic hazard to fish. In low concentrations in water and soil,. Sub-lethal concentrations in water can have adverse physiological effects on marine species. Free ammonia concentrations of 2.5 mg per litre at pH 7.4 to 8.5 are considered harmful to marine life. In water, free NH ₃ is considered to be the primary toxic form while the much more prevalent NH ₄ OH form is much less harmful.
BOD and COD	Not available
Products of Degradation	Nitrogen oxides (NO,NO ₂ ...), nitrates
Toxicity of the Products of Degradation	The products of degradation are less toxic than the original product. Special remarks on the products of degradation product may degrade water quality and taste. Notify downstream water users. Will dissolve and disperse in water.

Section 12. Disposal Considerations

WASTE DISPOSAL OR Call for assistance on treatment and disposal. Recover and place material in a suitable. RECYCLING container for intended use or disposal. Ensure disposal complies with government requirements and local regulations.

Section 13. Transport Information

DOT / TDG Classification	2
PIN And Shipping Name	PIN: UN1005 shipping name: anhydrous ammonia
Special Provisions for Transport	

Section 14. Other Information

MSDS Creation Date:	September 14, 2007
Revision #0 Date	

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