

# Chemical Profiles

## Ammonia

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## What are other names or identifying information for ammonia?

**CAS Registry No.:** 7664-41-7

**Other Names:** Anhydrous ammonia, Liquid ammonia

**Main Uses:** Used as a fertilizer, to make plastics, fibers and other chemicals, as a refrigerant, and in many other applications.

**Appearance:** Colourless gas.

**Odour:** Ammonia-like (pungent, suffocating)

**Canadian TDG:** UN1005

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## What is the WHMIS classification?

According to the Commission des normes, de l'équité, de la santé et de la sécurité du travail (CNESST), [ammonia](#) can be classified as:

Flammable gases - Category 1



Gases under pressure - Liquefied gas



Acute toxicity - inhalation - Category 3



Skin corrosion/irritation - Category 1



Serious eye damage/eye irritation - Category 1



The signal word is danger.

The hazard statements include:

- Extremely flammable gas
- Contains gas under pressure; may explode if heated

- Toxic if inhaled; Corrosive to the respiratory tract
- Causes severe skin burns and eye damage

Please note that this classification was retrieved from the [CNESST](#) site on February 21, 2023 and was established by CNESST personnel to the best of their knowledge based on data obtained from scientific literature and it incorporates the criteria contained in the *Hazardous Products Regulations* (SOR/2015-17). It does not replace the supplier's classification which can be found on its Safety Data Sheet.

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## What are the most important things to know about ammonia in an emergency?

**Emergency Overview:** Colourless gas. Ammonia-like odour. COMPRESSED GAS. Contains gas under pressure. May explode if heated. FLAMMABLE GAS. High concentrations can be a fire and explosion hazard, especially in confined spaces. Can decompose at high temperatures forming very flammable hydrogen gas. VERY TOXIC. Fatal if inhaled. Corrosive to the respiratory tract. CORROSIVE. Causes severe skin burns and eye damage. May cause frostbite.

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## What are the potential health effects of ammonia?

**Main Routes of Exposure:** Inhalation. Skin contact. Eye contact.

- **Inhalation:** VERY TOXIC, can cause death. Can cause severe irritation of the nose and throat. Can cause life-threatening accumulation of fluid in the lungs (pulmonary edema). Symptoms may include coughing, shortness of breath, difficult breathing and tightness in the chest. Symptoms may develop hours after exposure and are made worse by physical effort. Long-term damage may result from a severe short-term exposure.
- **Skin Contact:** CORROSIVE. The gas irritates or burns the skin. Permanent scarring can result. Direct contact with the liquefied gas can chill or freeze the skin (frostbite). Symptoms of more severe frostbite include a burning sensation and stiffness. The skin may become waxy white or yellow. Blistering, tissue death and infection may develop in severe cases.
- **Eye Contact:** CORROSIVE. The gas irritates or burns the eyes. Permanent damage including blindness can result. Direct contact with the liquefied gas can freeze the eye. Permanent eye damage or blindness can result.
- **Ingestion:** Not a relevant route of exposure (gas).
- **Effects of Long-Term (Chronic) Exposure:** May harm the respiratory system. Can irritate and inflame the airways.

- **Carcinogenicity:** Not known to cause cancer.
    - International Agency for Research on Cancer (IARC): Not specifically evaluated.
    - American Conference for Governmental Industrial Hygienists (ACGIH): Not specifically designated.
  - **Teratogenicity / Embryotoxicity:** Not known to harm the unborn child.
  - **Reproductive Toxicity:** Not known to be a reproductive hazard.
  - **Mutagenicity:** Not known to be a mutagen. Conclusions cannot be drawn from the limited studies available.
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## What are first aid measures for ammonia?

**Inhalation:** Take precautions to ensure your own safety before attempting rescue (e.g., wear appropriate protective equipment). Move victim to fresh air. If breathing is difficult, trained personnel should administer emergency oxygen. DO NOT allow victim to move about unnecessarily. Symptoms of pulmonary edema may be delayed. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

**Skin Contact:** Gas: flush with gently flowing water for 5 minutes. If irritation or pain persists, see a medical professional. Liquefied gas: quickly remove victim from source of contamination. DO NOT attempt to rewarm the affected area on site. DO NOT rub area, flush with water, or apply direct heat. Gently remove clothing or jewelry that may restrict circulation. Carefully cut around clothing that sticks to the skin and remove the rest of the garment. Loosely cover the affected area with a sterile dressing. Do not remove frozen clothing from frostbitten areas. If frostbite has NOT occurred, immediately and thoroughly wash contaminated skin with soap and water. DO NOT allow victim to drink alcohol or smoke. Get medical attention immediately. Treatment is urgently required. Transport to a hospital.

**Eye Contact:** If eye tissue is frozen, get medical attention immediately. Gas: immediately flush the contaminated eye(s) with gently flowing water for 15 minutes, occasionally lifting the upper and lower eyelids. If irritation or pain persists, see a doctor. Liquefied gas: move victim to fresh air. Immediately flush with gently flowing water. DO NOT attempt to rewarm. Cover both eyes with a sterile dressing. DO NOT allow victim to drink alcohol or smoke. Get medical attention immediately.

**Ingestion:** Not applicable (gas).

**First Aid Comments:** Some of the first aid procedures recommended here require advanced first aid training. All first aid procedures should be periodically reviewed by a medical professional familiar with the chemical and its conditions of use in the workplace.

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## What are fire hazards and extinguishing media for ammonia?

**Flammable Properties:** FLAMMABLE GAS. High airborne concentrations can be ignited and pose a significant fire and explosion hazard, especially in a confined space. A large and intense energy source is necessary to ignite ammonia gas.

**Suitable Extinguishing Media:** Carbon dioxide, dry chemical powder, appropriate foam, water spray or fog.

**Specific Hazards Arising from the Chemical:** Heat from fire can cause a rapid build-up of pressure inside cylinders. Explosive rupture and a sudden release of large amounts of gas may result. Cylinder may rocket. In a fire, the following hazardous materials may be generated: flammable hydrogen.

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## What are the stability and reactivity hazards of ammonia?

- **Chemical Stability:** Normally stable.
  - **Conditions to Avoid:** High temperatures. Open flames, sparks, static discharge, heat and other ignition sources. High energy sources, e.g. welding arcs.
  - **Incompatible Materials:** Increased risk of fire and explosion on contact with: oxidizing agents (e.g., peroxides), strong acids (e.g., hydrochloric acid), halogens (e.g., chlorine). Not corrosive to: carbon steel, aluminum alloys.
  - **Hazardous Decomposition Products:** None known.
  - **Possibility of Hazardous Reactions:** None known.
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## What are unintentional release measures for ammonia?

**Personal Precautions:** Evacuate the area immediately. Isolate the hazard area. Keep out unnecessary and unprotected personnel. Use personal protective equipment as required. Eliminate ignition sources. Increase ventilation to area or move leaking container to a well-ventilated and secure area.

**Methods for Containment and Clean-up:** Knock down gas with fog or fine water spray. Do not direct water at spill or source. If possible, turn leaking container so that gas escapes rather than liquefied gas. Dike spilled product to prevent runoff.

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## What handling and storage practices should be used when working with ammonia?

**Handling:** Immediately report leaks, spills or failures of the safety equipment (e.g. ventilation system). In event of a spill or leak, immediately put on escape-type respirator and exit the area. Do NOT work alone with this product. Get medical attention for all exposures. Symptoms can be delayed. Prevent unintentional contact with incompatible chemicals. Use corrosion-resistant tools and equipment. Eliminate heat and ignition sources such as sparks, open flames, hot surfaces and static discharge. Post "No Smoking" signs. Do not use near welding operations or other high energy sources. Do not weld, cut or perform hot work on empty container until all traces of product have been removed. Prevent heating. Use the pressure regulator appropriate for cylinder pressure and contents. Secure cylinder in an upright position. Protect cylinders from damage. Use a suitable hand truck to move cylinders; do not drag, roll, slide, or drop. Keep containers tightly closed when not in use or empty.

**Storage:** Store in an area that is: cool, dry, out of direct sunlight and away from heat and ignition sources, separate from incompatible materials, secure and separate from work areas, an approved, fire-resistant area. Store in the original, labelled, shipping container. Always secure (e.g., chain) cylinders in an upright position to a wall, rack or other solid structure. Empty containers may contain hazardous residue. Store separately. Keep closed. Comply with all applicable health and safety regulations, fire and building codes.

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## What is the American Conference of Governmental Industrial Hygienists (ACGIH®) recommended exposure limit for ammonia?

ACGIH® TLV® - TWA: 25 ppm

ACGIH® TLV® - STEL [C]: 35 ppm

**Exposure Guideline Comments:** TLV® = Threshold Limit Value. TWA = Time-Weighted Average. STEL = Short-term Exposure Limit. C = Ceiling limit.

Adapted from: 2022 TLVs® and BEIs® - Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices. Cincinnati: American Conference of Governmental Industrial Hygienists (ACGIH)

NOTE: In many (but not all) Canadian jurisdictions, the exposure limits are similar to the ACGIH® TLVs®. Since legislation varies by jurisdiction, contact your local jurisdiction for exact details. A list is available in the OSH Answers on [Canadian Governmental Occupational Health & Safety Departments](#).

A list of which acts and regulations that cover [exposure limits to chemical and biological agents](#) is available on our website. Please note that while you can see the list of legislation for free, you will need a subscription to view the actual documentation.

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## What are the engineering controls for ammonia?

**Engineering Controls:** Use a local exhaust ventilation and enclosure, if necessary, to control amount in the air. It may be necessary to use stringent control measures such as process enclosure to prevent product release into the workplace. For large scale use of this product: use non-sparking ventilation systems, approved explosion-proof equipment and intrinsically safe electrical systems in areas where this product is used and stored. Use an automatic leak detection system. Exhaust directly to the outside, taking any necessary precautions for environmental protection. Provide eyewash and safety shower if contact or splash hazard exists.

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## What Personal Protective Equipment (PPE) is needed when working with ammonia?

**Eye/Face Protection:** Wear chemical protective clothing e.g., gloves, aprons, boots. In some operations: wear a chemical protective, full-body encapsulating suit and self-contained breathing apparatus (SCBA). [Suitable materials](#) include (8 hours): butyl rubber, Viton®, Viton®/butyl rubber, Kemblok®, Chemprotex® 300, ChemMAX® (3 and 4 Plus), Frontline® 500, AlphaTec® (4000, EVO, VPS), Tychem® (Responder® CSM, 10000, and 10000 FR), Zytron® (500).

**Skin Protection:** Wear chemical protective clothing e.g. gloves, aprons, boots. In some operations: wear a chemical protective, full-body encapsulating suit and self-contained breathing apparatus (SCBA). [Suitable materials](#) include: butyl rubber, Viton®, Viton®/butyl rubber, Trelchem® HPS, Trelchem® VPS, Tychem® TK.

### Respiratory Protection:

Up to 250 ppm:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against ammonia\*; or Any supplied-air respirator\*.

Up to 300 ppm:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode\*; Any powered, air-purifying respirator with cartridge(s) providing protection against ammonia.

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against ammonia; Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against ammonia; Any self-contained breathing apparatus with a full facepiece; Any supplied-air respirator with a full facepiece.

\*Reported to cause eye irritation or damage; may require eye protection.

APF = Assigned Protection Factor

Recommendations apply only to National Institute for Occupational Safety and Health (NIOSH) approved respirators. Refer to the [NIOSH Pocket Guide to Chemical Hazards](#) for more information.

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