OEHHA

Ammonia

DEPARTMENT OF TOXIC SUBSTANCES CONTROL

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Recognizing Ammonia

Appearance: Pure anhydrous (i.e., without water) ammonia is a colorless gas at room temperature.

Odor: Very sharp, pungent, and suffocating odor. Olfactory fatigue can occur fairly rapidly, making a person unaware of increasing concentrations in the surrounding air.

Odor Threshold: Minimum threshold: 5 ppm.

Odor Safety Class: C (less than 50% of distracted individuals perceive warning of threshold limit value).

Vapor Density: 0.59 (air = 1.0). Ammonia is lighter than air. But vapors from pressurized ammonia are initially colder and heavier so they may concentrate near the ground or in depressions until they warm to room temperature and rise.

Containers & Packaging

Anhydrous ammonia is a gas at room temperature but becomes liquid when pressurized. It is typically found in pressurized steel tanks in a liquid form (Figure 1). Anhydrous ammonia can be obtained from commercial chemical supply companies, farms that use it for fertilizer, or from blueprint operations. ***Note:*** *Direct contact with liquid anhydrous ammonia as it is released from pressurized tanks can cause* ***severe frostbite.***

Aqueous (liquid) ammonia for household cleaning (e.g., "Parson's Ammonia") is a solution containing 5-10% ammonia gas dissolved in water. Household ammonia is not used in methamphetamine synthesis.

Figure 1: Anhydrous ammonia gas is stored and transported as a liquid in pressurized gas containers. Note greenish-blue corrosion on valves and fittings. "Secondary" containers such as these were not designed to hold ammonia and may fail at any time. *Photo Courtesy of CA Department of Justice.*

Role in Drug Synthesis

Ammonia is used with an alkali metal, typically lithium or sodium, in the "Nazi" method to synthesize methamphetamine.

Health Hazards

Inhalation Exposure: Vapors at a concentration of 50-100 ppm cause nose, throat, and airway irritation. This may lead to wheezing, shortness of breath, and chest pain. Inhalation of concentrated vapors may result in respiratory tract burns. Exposure to moderate or high vapor concentrations may also cause swelling in the nasal and upper respiratory tissues and fluid build-up in the lungs. This could result in breathing difficulty or life-threatening respiratory failure.

Skin (Dermal) Exposure: Direct contact can result in chemical burns, which feel soapy due to the action of ammonia on fat in tissues. Blistering, deep penetrating burns, and cell and tissue death may result. Less severe injury is characterized by gray-yellow soft regions. In severe cases, the skin appears black and leathery. Frostbite may also result from contact with anhydrous ammonia as it is released from pressurized tanks.

Eye Contact: Vapors at concentrations of 50-100 ppm cause irritation, tearing, and inflammation. Higher concentrations can cause severe injury including burns or temporary blindness. Severe exposure can damage the iris and cause cataracts. Hemorrhage, extensive loss of eye pigment, and glaucoma may also result. Contact with concentrated aqueous ammonia solutions can cause permanent eye injury, including blindness. Damage extent may not be identified for up to one week after initial injury.

Ingestion: Aqueous ammonia solutions may cause nausea, vomiting, and swelling of the lips, mouth, and throat. Ingestion of concentrated solutions may result in burns to the lips, mouth, and esophagus. Oral exposure does not typically result in systemic poisoning.

Chronic Effects: Repeated exposure may cause chronic skin, eye, and respiratory irritation. Chronic cough, asthma, and lung fibrosis may occur.

Clandestine Labs/ Methamphetamine: Ammonia

Environmental Concerns

Air: Ammonia gas is readily removed from air via wet deposition (rainfall), dry deposition, reaction with gas-phase nitric acid to form ammonium nitrate, and reaction with aerosols to produce ammonium salts.

Soil: Soil microorganisms rapidly take up ammonia; some convert it to nitrate, which is highly mobile in water. In soil, ammonia is also rapidly converted to ammonium ions.

Ground Water: The amount of anhydrous ammonia typically required for methamphetamine synthesis is not likely to cause significant ground water contamination. However, if a large spill occurs, ground water contamination may result.

Surface Water: Plants and microorganisms rapidly take up ammonia in water. Bacteria readily convert ammonia to nitrate, creating a biochemical oxygen demand several days after contamination. This can lead to depletion of dissolved oxygen and result in death to aquatic organisms, but only if large spills occur and contamination is highly significant.

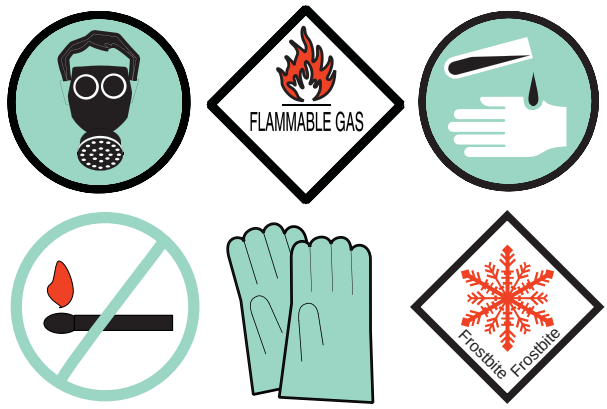
Indoors: Long-term contamination of indoor surfaces by anhydrous ammonia is not a concern. If spilled, liquefied anhydrous ammonia readily evaporates into the air. However, if sources of ammonia are present, such as with a leaking storage tank or cylinder, ammonia vapors can pose an immediate health concern.

Exposure Limits

Occupational Exposure Limits (NIOSH, OSHA, & ACGIH)
Short-Term Exposure Limit (STEL or ST): 35 ppm (24 mg/m^3)
8-Hour Time Weighted Average (TWA): 25 ppm (17 mg/m^3)
Immediately Dangerous (IDLH): 300 ppm

Preliminary Remediation Goals (PRGs)(U.S. EPA, Reg. 9):
Air: 0.14 ppm (0.1 mg/m^3)
Soil & Water: not available

Handling & Safety



First Aid

Inhalation Exposure: Move to fresh air. Administer oxygen if needed. If breathing difficullty continues, get medical attention.

Contact with Clothing or Skin (Dermal Exposure): Remove contaminated clothing. Flush exposed skin and hair with water for at least 15 minutes. Seek immediate medical attention. Treat burns as directed by medical personnel.

Contact with Eyes: Flush exposed eyes with water or saline solution for at least 15 minutes. Remove contact lenses if possible. Seek medical attention.

Ingestion (Oral) Exposure: Do not induce vomiting or administer activated charcoal. Do not perform gastric lavage or attempt neutralization. Conscious victims should be given 4-8 ounces of water or milk. Seek immediate medical attention.

Special Concerns for Children: Children may inhale relatively larger amounts of ammonia vapors due to their faster breathing rates and greater lung size to body weight ratio. They may also receive higher doses due to their short stature. Ammonia vapors from compressed tanks may initially settle close to the ground in the typical breathing zone for children.

Chemical Hazards

Reactivity: Anhydrous ammonia reacts with strong oxidizers, acids, halogens, bleach, salts of silver, zinc, copper, and other metals. It is corrosive to copper and galvanized surfaces.

Flammability: Anhydrous ammonia is considered nonflammable; however, at very high concentrations in air [15-28% (150,000-280,000 ppm)], it will explode if ignited. Because of this, anhydrous ammonia should be treated as a flammable gas. Pressurized tanks of any kind may rupture if heated.

Chemical Incompatibilities: Anhydrous ammonia is incompatible with acids, aldehydes, amides, halogens, metals, oxidizers, plastics, and sulfur.

More Information

Office of Environmental Health Hazard Assessment (OEHHA)
www.OEHHA.CA.Gov

Department of Toxic Substances Control (DTSC)
www.DTSC.CA.Gov

Authors: Karlyn Black Kaley, PhD, DABT & Charles Salocks, PhD, DABT • Graphic Design: Karlyn Black Kaley, PhD, DABT