

1. Material Identification

Product Name : Ammonium Hydroxide

Catalog Number : io-1716

CAS Number : 1336-21-6

Identified uses : Laboratory chemicals, manufacture of chemical compounds

Company : IonZ

>> R&D Use only

2. Hazards Identification

GHS Classification:

Flammable liquid (category 2)

Acute toxicity, oral (Category 3)

Acute toxicity, dermal (Category 3)

Acute toxicity, inhalation (Category 3)

Specific target organ toxicity, single exposure (Category 1)

Note

>> Pictograms displayed are for > 99.9% (6243 of 6247) of reports that indicate hazard statements. This chemical does not meet GHS hazard criteria for < 0.1% (4 of 6247) of reports.

Pictogram(s)



GHS Hazard Statements

>> H314 (99.9%): Causes severe skin burns and eye damage [Danger Skin corrosion/irritation]

>> H318 (10.4%): Causes serious eye damage [Danger Serious eye damage/eye irritation]

>> H335 (16.4%): May cause respiratory irritation [Warning Specific target organ toxicity, single exposure; Respiratory tract irritation]

>> H400 (99.8%): Very toxic to aquatic life [Warning Hazardous to the aquatic environment, acute hazard]

Precautionary Statement Codes

>> P260, P261, P264, P264+P265, P271, P273, P280, P301+P330+P331, P302+P361+P354, P304+P340, P305+P354+P338, P316, P317, P319, P321, P363, P391, P403+P233, P405, and P501

EPA Safer Chemical:

EPA labels products so that consumers can easily choose ones that are safer for people and the environment. When consumers see the Safer Choice label on a product, they can be confident that the ingredients have been through a rigorous EPA review. The label means that EPA scientists have evaluated every ingredient in the product to ensure it meets Safer Choice's stringent criteria. When people use Safer Choice products, they are protecting their families and the environment by making safer chemical choices.

EPA Safer Chemical

>> Chemical: Ammonium hydroxide

>> Yellow triangle – The chemical has met Safer Choice Criteria for its functional ingredient-class, but has some hazard profile issues. Specifically, a chemical with this code is not associated with a low level of hazard concern for all human

health and environmental endpoints. (See Safer Choice Criteria). While it is a best-in-class chemical and among the safest available for a particular function, the function fulfilled by the chemical should be considered an area for safer chemistry innovation.



Health Hazards:

- >> Excerpt from ERG Guide 154 [Substances – Toxic and/or Corrosive (Non-Combustible)]:
- >> TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death. Contact with molten substance may cause severe burns to skin and eyes. Avoid any skin contact. Fire may produce irritating, corrosive and/or toxic gases. Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination. (ERG, 2024)

ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> TOXIC and/or CORROSIVE; inhalation, ingestion or skin contact with material may cause severe injury or death.
- >> Contact with molten substance may cause severe burns to skin and eyes.
- >> Avoid any skin contact.
- >> Fire may produce irritating, corrosive and/or toxic gases.
- >> Runoff from fire control or dilution water may be corrosive and/or toxic and cause environmental contamination.
- >> Excerpt from ERG Guide 154 [Substances – Toxic and/or Corrosive (Non-Combustible)]:
- >> Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.). Corrosives in contact with metals may evolve flammable hydrogen gas. Containers may explode when heated. For electric vehicles or equipment, ERG Guide 147 (lithium ion or sodium ion batteries) or ERG Guide 138 (sodium batteries) should also be consulted. (ERG, 2024)

ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes.
- >> Some are oxidizers and may ignite combustibles (wood, paper, oil, clothing, etc.).
- >> Corrosives in contact with metals may evolve flammable hydrogen gas.
- >> Containers may explode when heated.
- >> For electric vehicles or equipment, GUIDE 147 (lithium ion or sodium ion batteries) or GUIDE 138 (sodium batteries) should also be consulted.
- >> Not combustible.

3. Composition/Information On Ingredients

Chemical name : Ammonium Hydroxide
CAS Number : 1336-21-6
Molecular Formula : H₅NO
Molecular Weight : 35.0460 g/mol

4. First Aid Measures

First Aid:

- >> Excerpt from ERG Guide 154 [Substances – Toxic and/or Corrosive (Non-Combustible)]:
- >> Refer to the "General First Aid" section. Specific First Aid: For corrosives, in case of contact, immediately flush skin or eyes with running water for at least 30 minutes. Additional flushing may be required. (ERG, 2024)

ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> General First Aid:
- >> Call 911 or emergency medical service.

- >> Ensure that medical personnel are aware of the material(s) involved, take precautions to protect themselves and avoid contamination.
- >> Move victim to fresh air if it can be done safely.
- >> Administer oxygen if breathing is difficult.
- >> If victim is not breathing:
- >> DO NOT perform mouth-to-mouth resuscitation; the victim may have ingested or inhaled the substance.
- >> If equipped and pulse detected, wash face and mouth, then give artificial respiration using a proper respiratory medical device (bag-valve mask, pocket mask equipped with a one-way valve or other device).
- >> If no pulse detected or no respiratory medical device available, provide continuous compressions. Conduct a pulse check every two minutes or monitor for any signs of spontaneous respirations.
- >> Remove and isolate contaminated clothing and shoes.
- >> For minor skin contact, avoid spreading material on unaffected skin.
- >> In case of contact with substance, remove immediately by flushing skin or eyes with running water for at least 20 minutes.
- >> For severe burns, immediate medical attention is required.
- >> Effects of exposure (inhalation, ingestion, or skin contact) to substance may be delayed.
- >> Keep victim calm and warm.
- >> Keep victim under observation.
- >> For further assistance, contact your local Poison Control Center.
- >> Note: Basic Life Support (BLS) and Advanced Life Support (ALS) should be done by trained professionals.
- >> Specific First Aid:
- >> For corrosives, in case of contact, immediately flush skin or eyes with running water for at least 30 minutes. Additional flushing may be required.
- >> In Canada, an Emergency Response Assistance Plan (ERAP) may be required for this product. Please consult the shipping paper and/or the "ERAP" section.

First Aid Measures

Inhalation First Aid

- >> Fresh air, rest. Artificial respiration may be needed. Refer for medical attention.

Skin First Aid

- >> Remove contaminated clothes. Rinse skin with plenty of water or shower for at least 15 minutes. Refer immediately for medical attention .

Eye First Aid

- >> Rinse with plenty of water for several minutes (remove contact lenses if easily possible). Refer immediately for medical attention.

Ingestion First Aid

- >> Rinse mouth. Do NOT induce vomiting. Give one or two glasses of water to drink. Refer for medical attention .

5. Fire Fighting Measures

- >> Excerpt from ERG Guide 154 [Substances – Toxic and/or Corrosive (Non-Combustible)]:
- >> SMALL FIRE: Dry chemical, CO2 or water spray.
- >> LARGE FIRE: Dry chemical, CO2, alcohol-resistant foam or water spray. If it can be done safely, move undamaged containers away from the area around the fire. Dike runoff from fire control for later disposal.
- >> FIRE INVOLVING TANKS, RAIL TANK CARS OR HIGHWAY TANKS: Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles. Do not get water inside containers. Cool containers with flooding quantities of water until well after fire is out. Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank. ALWAYS stay away from tanks in direct contact with flames. (ERG, 2024)

- >> In case of fire in the surroundings, use appropriate extinguishing media. In case of fire: keep drums, etc., cool by spraying with water.

6. Accidental Release Measures

Isolation and Evacuation:

Isolation and evacuation measures to take when a large amount of this chemical is accidentally released in an emergency.

- >> Excerpt from ERG Guide 154 [Substances – Toxic and/or Corrosive (Non-Combustible)]:
- >> IMMEDIATE PRECAUTIONARY MEASURE: Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- >> SPILL: Increase the immediate precautionary measure distance, in the downwind direction, as necessary.
- >> FIRE: If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions. (ERG, 2024)

Evacuation: ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> Immediate precautionary measure
- >> Isolate spill or leak area in all directions for at least 50 meters (150 feet) for liquids and at least 25 meters (75 feet) for solids.
- >> Spill
- >> For non-highlighted materials: increase the immediate precautionary measure distance, in the downwind direction, as necessary.
- >> Fire
- >> If tank, rail tank car or highway tank is involved in a fire, ISOLATE for 800 meters (1/2 mile) in all directions; also, consider initial evacuation for 800 meters (1/2 mile) in all directions.

Spillage Disposal:

Methods for containment and safety measures to protect workers dealing with a spillage of this chemical.

- >> Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Cautiously neutralize spilled liquid with dilute acid such as dilute sulfuric acid. Wash away remainder with plenty of water.

Accidental Release Measures

Public Safety: ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> CALL 911. Then call emergency response telephone number on shipping paper. If shipping paper not available or no answer, refer to appropriate telephone number listed on the inside back cover.
- >> Keep unauthorized personnel away.
- >> Stay upwind, uphill and/or upstream.
- >> Ventilate closed spaces before entering, but only if properly trained and equipped.

Spill or Leak: ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> ELIMINATE all ignition sources (no smoking, flares, sparks or flames) from immediate area.
- >> Do not touch damaged containers or spilled material unless wearing appropriate protective clothing.
- >> Stop leak if you can do it without risk.
- >> Prevent entry into waterways, sewers, basements or confined areas.
- >> Absorb or cover with dry earth, sand or other non-combustible material and transfer to containers.
- >> DO NOT GET WATER INSIDE CONTAINERS.

7. Handling And Storage

Safe Storage:

- >> Store in an area without drain or sewer access. Separated from food and feedstuffs. See Chemical Dangers. Cool. Well closed. Keep in a well-ventilated room. Provision to contain effluent from fire extinguishing.

Storage Conditions:

- >> Keep cool in strong glass, plastic, or rubber stoppered bottles not completely filled. /Ammonia water: 28–29%/

8. Exposure Control/ Personal Protection

- >> 18 mg/m

MAK (Maximale Arbeitsplatz Konzentration)

- >> 14 mg/m

Emergency Response: ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> Small Fire
 - >> Dry chemical, CO2 or water spray.
- >> Large Fire
 - >> Dry chemical, CO2, alcohol-resistant foam or water spray.
 - >> If it can be done safely, move undamaged containers away from the area around the fire.
 - >> Dike runoff from fire control for later disposal.
 - >> Fire Involving Tanks, Rail Tank Cars or Highway Tanks
 - >> Fight fire from maximum distance or use unmanned master stream devices or monitor nozzles.
 - >> Do not get water inside containers.
 - >> Cool containers with flooding quantities of water until well after fire is out.
 - >> Withdraw immediately in case of rising sound from venting safety devices or discoloration of tank.
 - >> ALWAYS stay away from tanks in direct contact with flames.
 - >> ERPG-1: 25 ppm (ammonia) – one hour exposure limit: 1 = mild transient health effects or objectionable odor [AIHA]
 - >> ERPG-2: 200 ppm – one hour exposure limit: 2 = impaired ability to take protective action [AIHA]
 - >> ERPG-3: 1,000 ppm – one hour exposure limit: 3 = life threatening health effects [AIHA]

Inhalation Risk:

- >> A harmful contamination of the air can be reached very quickly on evaporation of this substance at 20 °C.

Effects of Short Term Exposure:

- >> The substance is corrosive to the eyes, skin and respiratory tract. Corrosive on ingestion. Inhalation of high concentrations of the vapour may cause laryngeal oedema, inflammation of the respiratory tract and pneumonia. Exposure could cause asphyxiation due to swelling in the throat. The effects may be delayed.

Effects of Long Term Exposure:

- >> Repeated or prolonged inhalation may cause effects on the lungs.

Exposure Prevention

- >> STRICT HYGIENE! IN ALL CASES CONSULT A DOCTOR!

Inhalation Prevention

- >> Use ventilation, local exhaust or breathing protection.

Skin Prevention

- >> Protective gloves. Protective clothing.

Eye Prevention

- >> Wear face shield or eye protection in combination with breathing protection.

Ingestion Prevention

- >> Do not eat, drink, or smoke during work.

Exposure Control and Personal Protection

Protective Clothing: ERG 2024, Guide 154 (Ammonium hydroxide, with more than 10% but not more than 35% ammonia)

- >> Wear positive pressure self-contained breathing apparatus (SCBA).
- >> Wear chemical protective clothing that is specifically recommended by the manufacturer when there is NO RISK OF FIRE.
- >> Structural firefighters' protective clothing provides thermal protection but only limited chemical protection.

9. Physical And Chemical Properties

Molecular Weight:

- >> 35.046

Exact Mass:

- >> 35.037113783

Physical Description:

- >> Ammonium hydroxide appears as a colorless aqueous solution. Concentration of ammonia ranges up to approximately 30%. Ammonia vapors (which arise from the solution) irritate the eyes.
- >> VERY VOLATILE COLOURLESS AMMONIA SOLUTION IN WATER WITH PUNGENT ODOUR.

Color/Form:

- >> Colorless liquid

Odor:

- >> Intense, pungent, suffocating odor

Taste:

The sensation of flavor perceived in the mouth and throat on contact with a substance.

- >> Acrid taste

Boiling Point:

- >> 38 °C (25%)

Melting Point:

- >> -58 °C (25%)

Solubility:

- >> Exists only in solution
- >> Solubility in water: miscible

Density:

- >> About 0.90 @ 25 °C/25 °C
- >> Relative density (water = 1): 0.9 (25%)

Vapor Density:

- >> Relative vapor density (air = 1): 0.6

Vapor Pressure:

- >> 2160 mm Hg @ 25 °C
- >> Vapor pressure, kPa at 20 °C: 48 (25%)

Decomposition:

- >> When heated to decomposition it emits ammonia and nitroxides.

Corrosivity:

The ability of a chemical to damage or destroy other substances when it comes into contact.

- >> Dissolves copper, zinc

pH:

pH is an expression of hydrogen ion concentration in water. Specifically, pH is the negative logarithm of hydrogen ion (H⁺) concentration (mol/L) in an aqueous solution. The term is used to indicate basicity or acidity of a solution on a scale of 0 to 14, with pH 7 being neutral.

>> pH= 11.6 (1.0 N solution); 11.1 (0.1 N solution); 10.6 (0.01 N solution)

Odor Threshold:

>> Odor Threshold Low: 50.0 [ppm]

>> [HSDB] Odor threshold from CHRIS

Dissociation Constants:

>> pK_b= 4.767, K_b= 1.710X10⁻⁵ at 20 °C; pK_b= 4.751, K_b= 1.774X10⁻⁵ at 25 °C; pK_b= 4.740, K_b= 1.820X10⁻⁵ at 30 °C

10. Stability And Reactivity

>> Water soluble. Generates a small amount of heat when diluted with water.

11. Toxicological Information

Exposure Routes:

>> The substance can be absorbed into the body by inhalation of its aerosol or vapour and by ingestion.

Inhalation Exposure

>> Cough. Sore throat. Burning sensation. Laboured breathing. Shortness of breath.

Skin Exposure

>> Redness. Pain. Blisters. Serious skin burns.

Eye Exposure

>> Redness. Pain. Blurred vision. Severe burns.

Ingestion Exposure

>> Sore throat. Vomiting. Abdominal pain.

Adverse Effects:

An adverse effect is an undesired harmful effect resulting from a medical treatment or other intervention.

>> Dermatotoxin – Skin burns.

>> Lacrimator (Lachrymator) – A substance that irritates the eyes and induces the flow of tears.

>> Toxic Pneumonitis – Inflammation of the lungs induced by inhalation of metal fumes or toxic gases and vapors.

Toxicity Data:

>> LCLo (human) = 5,000 ppm

Antidote and Emergency Treatment:

>> Agents causing ocular burns, steps in treatment, and special problems are described. Injuries are caused by neutral organic, acid, and alkali compounds. Contact time and pH are the most important variables in any chemical burn. The corneal epithelium and endothelium provide a barrier to water soluble substances while the stroma is a barrier to lipid soluble substances. Alkali compounds cause most severe injuries depending on the hydroxyl ion concentration and the cation. Calcium hydroxide, sodium hydroxide, and ammonium hydroxide are most often responsible for alkali burns. Ammonium hydroxide penetrates most rapidly of all alkali compounds.

Human Toxicity Excerpts:

>> ... IN CASE IN WHICH 1 DROP OF AMMONIUM HYDROXIDE SOLN OF APPROX 9% CONCEN WAS ACCIDENTALLY APPLIED TO PATIENTS EYE, & IRRIGATION WITH WATER ... STARTED WITHIN 10 SEC BECAUSE OF IMMEDIATE SEVERE PAIN & BLEPHAROSPASM, PH OF CONJUNCTIVA & CORNEA ... WITHIN 3 MIN ... RETURNED TO NORMAL, YET MOST OF CORNEAL EPITHELIUM WAS ALREADY LOST.

Non-Human Toxicity Excerpts:

>> ... APPLICATION OF 28.5% AMMONIUM HYDROXIDE TO /RABBIT/ EYES FOR 2-20 SEC (BEFORE IRRIGATION WITH WATER) CAUSES INJURY RANGING FROM FAINT PERMANENT CORNEAL NEBULA TO PROFOUND CORNEAL OPACIFICATION & VASCULARIZATION PROPORTIONAL TO LENGTH OF EXPOSURE

Non-Human Toxicity Values:

>> LD50 Rat oral 350 mg/kg

12. Ecological Information

ICSC Environmental Data:

>> The substance is very toxic to aquatic organisms.

13. Disposal Considerations

Spillage Disposal

>> Evacuate danger area! Consult an expert! Personal protection: complete protective clothing including self-contained breathing apparatus. Ventilation. Do NOT let this chemical enter the environment. Cautiously neutralize spilled liquid with dilute acid such as dilute sulfuric acid. Wash away remainder with plenty of water.

Disposal Methods

>> SRP: At the time of review, criteria for land treatment or burial (sanitary landfill) disposal practices are subject to significant revision. Prior to implementing land disposal of waste residue (including waste sludge), consult with environmental regulatory agencies for guidance on acceptable disposal practices.

>> Neutralization: Put into large vessel containing water. Neutralize with hydrochloric acid. ... Recommendable methods: Landfill, ... chemical treatment. Not recommendable method: Thermal destruction. Peer-review: Small amounts only: Landfill, great dilution before discharge to sewer. Large amounts of ammonia in landfill leachate may make disposal of leachate difficult. (Peer-review conclusions of an IRPTC expert consultation (May 1985))

14. Transport Information

DOT

Ammonium Hydroxide

8

UN Pack Group: III

Reportable Quantity of 1000 lb or 454 kg

IATA

Ammonium Hydroxide

8,

UN Pack Group: III

15. Regulatory Information

Clean Water Act Requirements:

The Clean Water Act (CWA) of 1972 establishes the basic structure for regulating discharges of pollutants into the waters of the United States and regulating quality standards for surface waters. Under CWA, the U.S. Environmental Protection Agency (EPA) developed the Toxic Pollutant List (40 CFR Part 401.15) and the Priority Pollutant List (40 CFR Part 423, Appendix A). These lists are to be used by EPA and States to develop the Effluent Guidelines regulations and ensure water quality criteria and standards.

- >> Designated as a hazardous substance under section 311(b)(2)(A) of the Federal Water Pollution Control Act and further regulated by the Clean Water Act Amendments of 1977 and 1978. These regulations apply to discharges of this substance.

Regulatory Information

The Australian Inventory of Industrial Chemicals

- >> Chemical: Ammonium hydroxide

REACH Registered Substance

- >> Status: Cease Manufacture Update: 29-05-2013 <https://echa.europa.eu/registration-dossier/-/registered-dossier/7510>

New Zealand EPA Inventory of Chemical Status

- >> Ammonium hydroxide: Does not have an individual approval but may be used under an appropriate group standard

16. Other Information

Other Safety Information

Chemical Assessment

- >> IMAP assessments – Ammonium hydroxide: Environment tier I assessment
- >> IMAP assessments – Ammonia and Ammonium hydroxide: Human health tier II assessment

"The information provided is believed to be accurate but is not comprehensive and should be used as a reference. It reflects our current knowledge and is intended for safety guidance related to the product. This document does not constitute a warranty of the product's properties. Ionz is not responsible for any damages resulting from handling or contact with the product incorrectly."