

acceptable disposal practices. Generators of waste containing this contaminant (≥ 100 kg/mo) must conform with EPA regulations governing storage, transportation, treatment, and waste disposal. Incineration.

References

National Institute for Occupational Safety and Health, "Criteria for a Recommended Standard: Occupational Exposure to Inorganic Fluorides," NIOSH Doc. No. 76-103 (1976)

Sax, N. I., Ed., "Dangerous Properties of Industrial Materials Report," 4, No. 3, 36-38 (1984). (Ammonium Silicofluoride)

New York State Department of Health, *Chemical Fact Sheet* Ammonium Hexafluorosilicate, Albany, NY, Bureau of Toxic Substance Assessment (March 1986)

Ammonium hydroxide A:1110

Molecular Formula: H_3NO

Common Formula: NH_4OH

Synonyms: Ammonia aqueous; Ammonia water; Aqua ammonia; Aqueous ammonia; Burmar lab clean; Enplate NI-418B; Enstrip NP-1; Hidroxido amonico (Spanish); Household ammonia; Poly silicon etch; PPD 5932 developer; Pre-metal etch; RCA clean (step 1); Scan kleen; Scrubber-Vapox

CAS Registry Number: 1336-21-6

RTECS[®] Number: BQ9625000

DOT ID: UN2672 (10 - 35% NH_3)

EC Number: 007-001-01-2

Regulatory Authority and Advisory Bodies

Clean Water Act: 40CFR116.4 Hazardous Substances; RQ 40CFR117.3 (same as CERCLA)

Superfund/EPCRA 40CFR302.4, appendix A, Reportable Quantity (RQ): CERCLA, 1000 lb (454 kg); Section 313: Form R *de minimis* concentration reporting level: 1.0% (as ammonia). NH_3 Equivalent molecular weight: 48.59

Canada, WHMIS, Ingredients Disclosure List Concentration 1%

Cited in U.S. State Regulations: California (G), Illinois (G), Massachusetts (G), New Hampshire (G), New Jersey (G), Oklahoma (G), Pennsylvania (G).

Description: Ammonium Hydroxide is a colorless to milky-white solution of ammonia, with a strong, irritating odor. Molecular weight: 35.05; Boiling point = 37.8°C (25% NH_3); Freezing/Melting point = -77°C ; -58°C (25% NH_3); Vapor pressure = 11.9 mm; 48 (25% NH_3) Hg @ 20°C . The Odor Threshold for ammonia is 0.043 - 47 ppm. Soluble in water.

Potential Exposure: It is used in detergents, stain removers, bleaches, dyes, fibers, and resins.

Incompatibilities: Solution is strongly alkaline. Violent reaction with strong oxidizers, acids (exothermic reaction with strong mineral acids). Shock-sensitive compounds may be formed with halogens, mercury oxide; silver oxide. Fire and explosions may be caused by contact

with β -propiolactone, silver nitrate; ethyl alcohol; silver permanganate; trimethylammonium amide; 1-chloro-2,4-dinitrobenzene, *o*-chloronitrobenzene, platinum, trioxygen difluoride; selenium difluoride dioxide; boron halides; mercury, chlorine, iodine; bromine, hypochlorites, chlorine bleach; amides, organic anhydrides; isocyanates, vinyl acetate; alkylene oxides; epichlorohydrin; aldehydes. Attacks some coatings, plastics and rubber. Attacks copper, brass, bronze, aluminum, steel, zinc, and their alloys.

Permissible Exposure Limit in Air

ACGIH TLV^{®1}: 25 ppm/17 mg/m^3 TWA; 35 ppm/24 mg/m^3 STEL

NIOSH REL: 25 ppm/18 mg/m^3 TWA; 35 ppm/27 mg/m^3 STEL

OSHA PEL: 50 ppm/35 mg/m^3 TWA

DFG MAK: 20 ppm/14 mg/m^3 ; Peak Limitation Category I(2); Pregnancy Risk Group C (2004).

NIOSH IDLH = 300 ppm

Arab Republic of Egypt: TWA 25 ppm (18 mg/m^3), 1993; Australia: TWA 25 ppm (18 mg/m^3); STEL 35 ppm, 1993; Austria: MAK 25 ppm (18 mg/m^3), 1999; Belgium: TWA 25 ppm (17 mg/m^3); STEL 35 ppm (24 mg/m^3), 1993; Denmark: TWA 25 ppm (18 mg/m^3), 1999; Finland: TWA 25 ppm (18 mg/m^3); STEL 40 ppm (30 mg/m^3), 1993; France: VME 25 ppm (18 mg/m^3), VLE 50 ppm (36 mg/m^3), 1999; the Netherlands: MAC-TGG 14 mg/m^3 , 2003; India: TWA 25 ppm (18 mg/m^3); STEL 35 ppm (27 mg/m^3), 1993; Japan: 25 ppm (17 mg/m^3), 1999; Norway: TWA 25 ppm (18 mg/m^3), 1999; the Phillipines: TWA 50 ppm (30 mg/m^3), 1993; Poland: MAC (TWA) 20 mg/m^3 ; MAC (STEL) 27 mg/m^3 , 1999; Russia: TWA 25 ppm; STEL 20 mg/m^3 , 1993; Sweden: NGV 25 ppm (18 mg/m^3), TGV 50 ppm (35 mg/m^3), 1999; Switzerland: MAK-W 25 ppm (18 mg/m^3), KZG-W 50 ppm (36 mg/m^3), 1999; Thailand: TWA 50 ppm (35 mg/m^3), 1993; Turkey: TWA 25 ppm (35 mg/m^3), 1993; United Kingdom: TWA 25 ppm (18 mg/m^3); STEL 35 ppm (25 mg/m^3), 2000; Argentina, Bulgaria, Columbia, Jordan, South Korea, New Zealand, Singapore, Vietnam: ACGIH TLV[®]: STEL 35 ppm.

Determination in Air: Sampling by absorption in sulfuric acid followed by measurement by ion chromatography, conductivity. Use NIOSH Analytical Method #6015, #6016.

Permissible Concentration in Water: Russia^[43] has set a MAC of 2.0 mg/ml in water bodies used for domestic purposes and 0.05 mg/ml in water bodies used for fishery purposes.

Routes of Entry: Ingestion, skin and/or eye contact.

Harmful Effects and Symptoms

Short Term Exposure: Ammonium hydroxide is a corrosive chemical and can severely burn the skin and eyes, causing permanent damage. Exposure can severely irritate the nose, throat and lungs. Inhalation may cause pulmonary edema, which can be delayed for several hours; there is a risk of death in serious cases.

Long Term Exposure: Long-term exposure at low levels may cause chronic bronchitis. Repeated skin contact can cause dermatitis, dryness, itching, and redness.

Points of Attack: Lungs, skin, eyes.

Medical Surveillance: lung function tests. Consider chest x-ray following acute exposure.

First Aid: If this chemical gets into the eyes, remove any contact lenses at once and irrigate immediately for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately. If this chemical contacts the skin, remove contaminated clothing and wash immediately with soap and water. Seek medical attention immediately. If this chemical has been inhaled, remove from exposure, begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped. Transfer promptly to a medical facility. When this chemical has been swallowed, get medical attention. If victim is conscious, administer water or milk. Do not induce vomiting. Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed. As first aid for pulmonary edema, a doctor or authorized paramedic may consider administering a corticosteroid spray.

Personal Protective Methods: Wear protective gloves and clothing to prevent any reasonable probability of skin contact. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation. All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work. Contact lenses should not be worn when working with this chemical. Wear splash-proof chemical goggles and face shield unless full face-piece respiratory protection is worn. Employees should wash immediately with soap when skin is wet or contaminated. Provide emergency showers and eyewash. Specific engineering controls are recommended for ammonia by NIOSH in criteria document #74-136 (Ammonia).

Respirator Selection:

NIOSH: 250 ppm: CcrS* (APF = 10) (any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern); or Sa* (APF = 10) (any supplied-air respirator). 300 ppm: Sa:Cf* (APF = 25) (any supplied-air respirator operated in a continuous-flow mode); or PaprS* (APF = 25) (any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern); or CcrFS (APF = 50) [any chemical cartridge respirator with a full face-piece and cartridge(s) providing protection against the compound of concern]; or GmFS (APF = 50) [any air-purifying, full-face-piece respirator (gas mask) with a chin-style, front-or back-mounted canister providing protection against the compound of concern]; or ScbaF (APF = 50) (any self-contained breathing apparatus with a full face-piece); or SaF (APF = 50) (any supplied-air respirator with a full face-piece). *Emergency or planned entry into unknown concentrations or IDLH conditions:*

ScbaF:Pd,Pp (APF = 10,000) (any self-contained breathing apparatus that has a full face-piece and is operated in a pressure-demand or other positive-pressure mode); or SaF:Pd,Pp:AScba (APF = 10,000) (any supplied-air respirator that has a full face-piece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary, self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode). *Escape:* GmFS (APF = 50) [any air-purifying, full-face-piece respirator (gas mask) with a chin-style, front-or back-mounted canister providing protection against the compound of concern]; or ScbaE (any appropriate escape-type, self-contained breathing apparatus).

Storage: Prior to working with this chemical you should be trained on its proper handling and storage. Store in temperatures below 25°C/77°F. Do not fill bottles completely. Store in tightly-closed, strong glass, plastic or rubber-stoppered containers in a cool, well ventilated area. Where possible, automatically pump liquid from drums or other storage containers to process containers. Sources of ignition, such as smoking and open flames, are prohibited where this chemical is used, handled, or stored in a manner that could create a potential fire or explosion hazard.

Shipping: Ammonium hydroxide-ammonia solution, [rel. density between 0.880 - 0.957 @15°C in H₂O, with 10 - 35% NH₃]. UN/DOT label required "CORROSIVE MATERIAL." Quantity limitations: Passenger aircraft/rail: 5 L; Cargo aircraft only: 60 L This material is in Hazard Class 8 and Packing Group III.

Spill Handling: Evacuate persons not wearing protective equipment from area of spill or leak until clean-up is complete. Remove all ignition sources. Ventilate closed spaces before entering them. Ventilate area of spill or leak. Absorb liquids in vermiculite, dry sand; earth, or a similar material and deposit in sealed containers. It may be necessary to contain and dispose of this chemical as a hazardous waste. If material or contaminated runoff enters waterways, notify downstream users of potentially contaminated waters. Contact your Department of Environmental Protection or your regional office of the federal EPA for specific recommendations. If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable. If professional environmental engineering assistance is required, contact the U.S. EPA Environmental Response Team at (908) 548-8730 (24-hour response line).

Fire Extinguishing: Poisonous gases, including ammonia and nitrogen oxides; are produced in fire. Use dry chemical, carbon dioxide; water spray; or foam extinguishers. Vapors are heavier than air and will collect in low areas. Vapors in confined areas may explode when exposed to fire. Storage containers and parts of containers may rocket great distances, in many directions. If material or contaminated runoff enters waterways, notify downstream users of potentially

contaminated waters. Notify local health and fire officials and pollution control agencies. From a secure, explosion-proof location, use water spray to cool exposed containers. If cooling streams are ineffective (venting sound increases in volume and pitch, tank discolors, or shows any signs of deforming), withdraw immediately to a secure position. If employees are expected to fight fires, they must be trained and equipped in OSHA 1910.156. The only respirators recommended for fire fighting are self-contained breathing apparatuses that have full face-pieces and are operated in a pressure-demand or other positive-pressure mode.

Disposal Method Suggested: Dilute with water, neutralize with HCl and discharge to sewer.^[22]

References

Sax, N. I., Ed., "Dangerous Properties of Industrial Materials Report," 2, No. 3, 41-44 (1982)

New Jersey Department of Health and Senior Services, *Hazardous Substances Fact Sheet: Ammonium Hydroxide*, Trenton, NJ (March 2002)

Ammonium metavanadate A:1120

Molecular Formula: H_4NO_3V

Common Formula: NH_4VO_3

Synonyms: Ammonium vanadate; Vanadate (V031-), ammonium; Vanadato amonico (Spanish); Vanadic acid, ammonium salt

CAS Registry Number: 7803-55-6

RTECS® Number: YW0875000

DOT ID: UN2859

Regulatory Authority and Advisory Bodies

Air Pollutant Standard Set. See below, "Permissible Exposure Limits in Air" section.

U.S. EPA Hazardous Waste Number (RCRA No.): P119
RCRA 40CFR261, appendix 8, Hazardous Constituents
RCRA Land Ban Waste Restrictions
Superfund/EPCRA 40CFR302.4, appendix A,
Reportable Quantity (RQ): CERCLA, 1000 lb (454 kg)
Canada, WHMIS, Ingredients Disclosure List
Concentration 1%

Cited in U.S. State Regulations: Louisiana (G), Massachusetts (G), New Hampshire (G), New Jersey (G), Pennsylvania (G), Vermont (G), Virginia (G), Washington (G), Wisconsin (G).

Description: Ammonium metavanadate is a white or slightly yellow crystalline powder. Molecular weight = 116.97; Freezing/Melting point = 200°C (decomposes). Slightly soluble in water, with decomposition.

Potential Exposure: It is used in the metals industry to make alloys, chemical reactions, dyes, inks, varnishes, printing, medicines, and photography.

Incompatibilities: Moisture.

Permissible Exposure Limit in Air

OSHA PEL: 0.05 mg[V₅O₅]/m³ TWA (*dust*); respirable fraction; 0.1 mg[V₅O₅]/m³ Ceiling Concentration, (fume)

NIOSH REL: 1.0 mg[V]/m³ TWA

ACGIH TLV^{®[1]}: 0.05 mg[V₅O₅]/m³ TWA, Not classifiable as a human carcinogen, (dust or fume)

DFG MAK: Carcinogen Category 2; Germ Cell Mutagen Group 2 (2005) vanadium inorganic compounds

NIOSH IDLH= 35 mg[V]/m³

These levels are for air levels only. When skin contact also occurs, overexposure is possible even though air levels are less than the airborne permissible limits. For fume limits see "vanadium metal" (CAS 7440-62-2).

Determination in Air: Use NIOSH Analytical Method 7300^[18] #7504, Vanadium oxides.

Permissible Concentration in Water: Russia has set^[43] a MAC of 0.1 mg/L for pentavalent vanadium in water for domestic purposes.

Routes of Entry: Inhalation, skin and/or eye contact.

Harmful Effects and Symptoms

Short Term Exposure: Irritates the eyes, nose, and respiratory tract. Inhalation can cause coughing, wheezing and phlegm. Exposure may cause headache and a green coating on the tongue. Higher exposures may cause pneumonia an/or pulmonary edema, which can be delayed for several hours; there is a risk of death in serious cases. The oral LD₅₀ for rats is 160 mg/kg.

Long Term Exposure: Ammonium metavanadate may be a reproductive hazard. Repeated exposure may cause lung irritation and bronchitis.

Points of Attack: Eyes, skin and lungs.

Medical Surveillance: lung function tests. Consider x-ray following acute overexposure. Regulatory exams that include lung function, x-ray, and skin tests are proposed in criteria document NIOSH 77-222.

First Aid: If this chemical gets into the eyes, remove any contact lenses at once and irrigate immediately for at least 15 minutes, occasionally lifting upper and lower lids. Seek medical attention immediately. If this chemical contacts the skin, remove contaminated clothing and wash immediately with soap and water. Seek medical attention immediately. If this chemical has been inhaled, remove from exposure, begin rescue breathing (using universal precautions) if breathing has stopped and CPR if heart action has stopped. Transfer promptly to a medical facility. When this chemical has been swallowed, get medical attention. Give large quantities of water and induce vomiting. Do not make an unconscious person vomit. Medical observation is recommended for 24 to 48 hours after breathing overexposure, as pulmonary edema may be delayed. As first aid for pulmonary edema, a doctor or authorized paramedic may consider administering a corticosteroid spray.

Personal Protective Methods: Wear protective gloves and clothing to prevent any reasonable probability of skin contact. Safety equipment suppliers/manufacturers can provide recommendations on the most protective glove/clothing material for your operation. All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.