ionz

SAFETY DATA SHEET

Updated on 26/09/2024

1. Material Identification

Product Name : Ammonium chloride
Catalog Number : io-1711
CAS Number : 12125-02-9
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% (3374 of 3376) of reports that indicate hazard statements. This chemical does not meet GHS hazard criteria for < 0.1% (2 of 3376) of reports.

Pictogram(s)

>> Warning

GHS Hazard Statements

>> H302 (99.9%): Harmful if swallowed [Warning Acute toxicity, oral]

>> H319 (> 99.9%): Causes serious eye irritation [Warning Serious eye damage/eye irritation]

Precautionary Statement Codes

>> P264, P264+P265, P270, P280, P301+P317, P305+P351+P338, P330, P337+P317, and P501

NFPA 704 Diamond

NFPA Health Rating

>> 2 - Materials that, under emergency conditions, can cause temporary incapacitation or residual injury.

NFPA Fire Rating

>> 0 - Materials that will not burn under typical fire conditions, including intrinsically noncombustible materials such as concrete, stone, and sand.

NFPA Instability Rating

>> 0 - Materials that in themselves are normally stable, even under fire conditions.

Health Hazards:

>> Inhalation of fumes irritates respiratory passages. Ingestion irritates mouth and stomach. Fumes are irritating to eyes. Contact with skin may cause irritation. (USCG, 1999)

>> Special Hazards of Combustion Products: Toxic and irritating ammonia and hydrogen chloride gases may form in fire.

>> Behavior in Fire: May volatilize and condense on cool surfaces. (USCG, 1999)

>> Not combustible. Gives off irritating or toxic fumes (or gases) in a fire.

3. Composition/Information On Ingredients

Chemical name : Ammonium chloride
CAS Number : 12125-02-9
Molecular Formula : ClH4N
Molecular Weight : 53.4900 g/mol

4. First Aid Measures

First Aid:

>> Excerpt from NIOSH Pocket Guide for Ammonium chloride fume:

>> Eye: IRRIGATE IMMEDIATELY - If this chemical contacts the eyes, immediately wash (irrigate) the eyes with large amounts of water, occasionally lifting the lower and upper lids. Get medical attention immediately.

>> Skin: SOAP WASH IMMEDIATELY - If this chemical contacts the skin, immediately wash the contaminated skin with soap and water. If this chemical penetrates the clothing, immediately remove the clothing, wash the skin with soap and water, and get medical attention promptly.

>> Breathing: RESPIRATORY SUPPORT - If a person breathes large amounts of this chemical, move the exposed person to fresh air at once. If breathing has stopped, perform artificial respiration. Keep the affected person warm and at rest. Get medical attention as soon as possible. (NIOSH, 2024)

First Aid Measures

Inhalation First Aid

>> Fresh air, rest. Refer for medical attention.

Skin First Aid

>> Remove contaminated clothes. Rinse skin with plenty of water or shower.

Eye First Aid

>> First rinse with plenty of water for several minutes (remove contact lenses if easily possible), then refer for medical attention.

Ingestion First Aid

>> Rinse mouth. Give one or two glasses of water to drink. Rest. Refer for medical attention .

5. Fire Fighting Measures

>> Gives off irritating or toxic fumes (or gases) in a fire.

>> In case of fire in the surroundings, use appropriate extinguishing media.

6. Accidental Release Measures

Spillage Disposal:

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

>> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Wash away remainder with plenty of water.

7. Handling And Storage

Safe Storage:

>> Separated from ammonium nitrate and potassium chlorate. Dry.

Storage Conditions:

>> Keep container tightly closed in a dry and well-ventilated place. Hygroscopic.

8. Exposure Control/ Personal Protection

REL-TWA (Time Weighted Average)

>> 10 mg/m³

REL-STEL (Short Term Exposure Limit)

>> 20 mg/m³

>> TWA 10 mg/m3 ST 20 mg/m3

>> none See Appendix G

>> 10.0 [mg/m3]

TLV-STEL

>> 20.0 [mg/m3]

>> 10 mg/m

TLV-TWA (Time Weighted Average)

>> 10 mg/m³ [1970]

TLV-STEL (Short Term Exposure Limit)

>> 20 mg/m³ [1970]

Inhalation Risk:

>> Evaporation at 20 °C is negligible; a nuisance-causing concentration of airborne particles can, however, be reached quickly.

Effects of Short Term Exposure:

>> The substance is irritating to the eyes, skin and respiratory tract.

Inhalation Prevention

>> Use ventilation (not if powder), local exhaust or breathing protection.

Skin Prevention

>> Protective gloves.

Eye Prevention

>> Wear safety spectacles.

Ingestion Prevention

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

9. Physical And Chemical Properties

Molecular Weight:

>> 53.49

Exact Mass:

>> 53.0032268

Physical Description:

>> Ammonium chloride is a white crystalline solid. It is soluble in water(37%). The primary hazard is the threat posed to the environment. Immediate steps should be taken to limit its spread to the environment. It is used to make other ammonium compounds, as a soldering flux, as a fertilizer, and for many other uses.

>> ODOURLESS COLOURLESS-TO-WHITE HYGROSCOPIC SOLID IN VARIOUS FORMS.

Color/Form:

>> Colorless crystals or crystalline masses, or white, granular powder

Odor:

>> Odorless

Taste:

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

>> Cooling, saline

Boiling Point:

>> Sublimes (NIOSH, 2024)

>> 520 °C

Melting Point:

>> 662 °F (Sublimes) (NIOSH, 2024)

Solubility:

>> 37 % (NIOSH, 2024)

>> Solubility in water, g/100ml at 25 °C: 28.3

Density:

>> 1.53 at 68 °F (USCG, 1999) - Denser than water; will sink

>> 1.5 g/cm³

Vapor Pressure:

>> 1 mmHg at 321 °F (NIOSH, 2024)

>> Vapor pressure, kPa at 160 °C: 0.13

Stability/Shelf Life:

>> Stable under recommended storage conditions.

Decomposition:

>> Melting point: 338 °C (sublimes)

>> 338 °C

Corrosivity:

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

>> At fire temp corrodes metals

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 of aqueous solution (25 °C): 1% 5.5; 3% 5.1; 10% 5.0

Refractive Index:

>> Index of refraction: 1.642

10. Stability And Reactivity

>> Soluble in water. Slowly releases hydrogen chloride (USCG, 1999).

CSL No

>> CSL00206

Reactants/Reagents

>> (SP-4-1)-[29H,31H-Phthalocyanine-2,9,16,23-tetracarboxamidato(2-)-κN29,κN30,κN31,κN32]zinc + Zincate(4-), [29H,31H-phthalocyanine-2,9,16,23-tetracarboxylato(6-)-κN29,κN30,κN31,κN32]-, hydrogen (1:4), (SP-4-1)- + Trimellitic anhydride + Urea + Zinc acetate + Ammonium chloride + Ammonium molybdate ((NH4)6Mo7O24) + Sodium hydroxide + Hydrochloric acid

Warning Message

>> "An explosion accident occurred when synthesizing Zn(II)-2,9,16,23-tetracarboxyphthalocyanine from trimellitic anhydride, urea, and zinc acetate. In this work, we discuss the direct causes of this explosion by investigating the thermal stability of the reaction with differential scanning calorimetry. Furthermore, four factors leading to explosions in closed systems have been summarized, including vessel damage, system volume reduction, increasing temperature, and gas generation. Finally, we propose technical and managerial measures for preventing explosions in a closed system, aiming to help scientific researchers prevent potential explosion accidents in academic laboratories." (abstract of paper)

GHS Category

>> Explosive,Gas Emitter

Reaction Scale

>> Medium (up to 100g)

DOI Link

>> 10.1021/acs.chas.9b00028

Reference Source

>> Literature Reference

Modified Date

>> 10/22/2022

Create Date

>> 10/22/2022

11. Toxicological Information

Toxicity Summary:

>> IDENTIFICATION AND USE: Ammonium chloride is a white, fine or coarse, crystalline powder. it is a good fertilizer for important crops in rainy climates, particularly for rice. It is not registered for current use in the U.S., but approved pesticide uses may change periodically and so federal, state and local authorities must be consulted for currently approved uses. Ammonium chloride is used also as a flux in zinc and tin plating; electroplating, electrolytic refining of zinc; etching solutions in manufacture of printed circuit boards; in dry and Leclanche batteries; manufacturing of explosives; flame suppressant; hardener for formaldehyde-based adhesives; mordant for dyes and printing. It is used as medication particularly in diuretics, expectorants. HUMAN EXPOSURE AND TOXICITY: Potential symptoms of overexposure to fumes are irritation of eyes, skin, and respiratory system; cough, dyspnea, pulmonary sensitization. Large doses of ammonium chloride may cause metabolic acidosis secondary to hyperchloremia, especially in patients with impaired renal function. Other adverse effects of excessive ammonium chloride dosage include rash, headache, hyperventilation, bradycardia, progressive drowsiness, mental confusion, and phases of excitement alternating with coma. Calcium-deficient tetany, hyperglycemia, glycosuria, twitching, hyperreflexia, and EEG abnormalities have also been reported. Most of these adverse effects are secondary to ammonia toxicity resulting from inability of the liver to convert the ammonium ion to urea. Because rapid IV injection may increase the likelihood of ammonia toxicity, IV

infusions of ammonium chloride should be administered slowly to permit metabolism of ammonium ions by the liver. Patients receiving ammonium chloride should be closely monitored for signs and symptoms of ammonia toxicity such as pallor, sweating, irregular breathing, vomiting, bradycardia, cardiac arrhythmias, local or generalized twitching, asterixis, tonic seizures, and coma. ANIMAL STUDIES: Acute exposure in mice by intravenous administration resulted in hyperventilation and clonic movements which were followed sometimes by tonic extensor convulsions, but usually by profound coma; death was preceded by convulsions, but survivors made complete and rapid recovery. This syndrome was potentiated by short periods of hypoxia. In rabbits, replacement of aq. humor with 1% solution of ammonium chloride has caused considerable hyperemia of iris, but by next day eyes were almost normal, and in another day were completely recovered. The ingestion of ammonium chloride in doses of around 500-1000 mg/kg bw/day, for periods ranging from 1 to 8 days, has induced metabolic acidosis in mice, guinea-pigs, rats, rabbits, and dog. Pulmonary edema, central nervous system dysfunction, and renal changes are reported to have occurred after ingestion of ammonium chloride. Ammonium chloride is reported to cause alterations in calcium and bone metabolism in various species. Specific toxic effects on the kidneys as renal hypertrophy were found in rats receiving ammonium chloride in the diet. Other salts (ammonium citrate or sodium chloride) did not induce such effects. Rabbits showed cellular swelling and karyolysis of kidney tubulus cells after two daily oral administrations of 16.2 g/animal ammonium chloride. One-sixth molar ammonium chloride was given to mice orally in the drinking water after day 7 during pregnancy and although the offspring were small sized no congenital defects were found. In other study mice were given 600 mg/kg orally at 8 and 10 am and 12 and 1 pm on day 10 of gestation and produced 7% ectrodactyly in the offspring. Negative in the Ames test using Salmonella typhimurium TA 98, TA 100, TA 1535, TA 1537, TA 1538 at doses with and without metabolic activation. Negative in the Ames test using Escherichia coli WP2uvrA with and without metabolic activation. ECOTOXICITY STUDIES: Four simultaneous early life-stage ammonia tests with small mouth bass were carried out at 4 different pH levels ranging from 6.6 to 8.7. Exposure to ammonium chloride solutions began on 2 to 3-day old embryos and lasted for 32 days. Concentrations found to retard growth ranged from 0.056 mg/L at pH 6.60 to 0.865 mg/L at pH 8.68. Groups of 180 Coho salmon were exposed to ammonium chloride at concentrations of 0.019-0.33 mg/L for 91 days. In high dose animals the hemoglobin content and hematocrit was significantly reduced and the percentage of immature erythrocytes in blood was increased. The key species, the earthworm Eisenia fetida, was subjected to a series of tests in solid phase mesocosms and full-scale units. The solid phase tests showed a relatively low toxicity to ammonium with ammonium chloride having an LC50 for ammonium of 1.49 g/kg.

Drug Induced Liver Injury:

This compound's potential to cause drug-induced liver injury. This information is from the FDA's Drug-Induced Liver Injury Rank (DILIrank) dataset. DILIrank groups more than 1,000 FDA-approved drugs into 4 categories (most-, less-, no-, and ambiguous-DILI-concerns). DILIrank assigns a severity grade, ranging from 0 (no-DILI-concern) to 8 (fatal hepatotoxicity).

Compound

>> ammonium chloride

DILI Annotation

>> No-DILI-Concern

Label Section

>> No match

References

>> M Chen, V Vijay, Q Shi, Z Liu, H Fang, W Tong. FDA-Approved Drug Labeling for the Study of Drug-Induced Liver Injury, Drug Discovery Today, 16(15-16):697-703, 2011. PMID:21624500 DOI:10.1016/j.drudis.2011.05.007

>> M Chen, A Suzuki, S Thakkar, K Yu, C Hu, W Tong. DILIrank: the largest reference drug list ranked by the risk for developing drug-induced liver injury in humans. Drug Discov Today 2016, 21(4): 648-653. PMID:26948801 DOI:10.1016/j.drudis.2016.02.015

Exposure Routes:

>> The substance can be absorbed into the body by inhalation of dust or fume and by ingestion.

>> inhalation, skin and/or eye contact

Inhalation Exposure

>> Cough. Sore throat.

Skin Exposure

>> Redness.

Eye Exposure

>> Redness. Pain.

Ingestion Exposure

>> Nausea. Sore throat. Vomiting.

>> irritation eyes, skin, respiratory system; cough, dyspnea (breathing difficulty), pulmonary sensitization

Target Organs:

Organs that are affected by exposure to this chemical. Information in this section reflects human data unless otherwise noted.

>> Eyes, skin, respiratory system

Interactions:

>> Cisplatin (cis-diamminedichloroplatinum II, CDDP) acts as a therapeutic agent by initiating cellular apoptosis. However, side-effects and drug resistance limit the clinical use of cisplatin. Numerous studies have focused on the drug-target interactions, cellular pharmacology and pharmacokinetics of cisplatin. Newly developed treatment strategies are needed in order to be used in combination with cisplatin, with the aim to minimize toxicity and to circumvent cisplatin resistance. Ammonium chloride (NH4Cl) is widely used in various areas, but its use as a combination agent with cisplatin for the treatment of cancer cells has not been previously reported. In the present study, we showed that NH4Cl could be potentially used as an effective agent in cisplatin combination treatment of HeLa human cervical cancer (HCC) cells. Cisplatin was found to inhibit cell growth, as well as to induce cell apoptosis and DNA double-strand breaks. In addition, treatment with NH4Cl increased the rate of cell apoptosis and the activation of caspase-3. Particularly, we found that NH4Cl treatment increased cisplatin induced phosphorylation of H2AX. In conclusion, our data indicate that NH4Cl enhances cisplatin cytotoxicity through increased DNA damage in HeLa HCC cells.

Antidote and Emergency Treatment:

>> Immediate first aid: Ensure that adequate decontamination has been carried out. If patient is not breathing, start artificial respiration, preferably with a demand valve resuscitator, bag-valve-mask device, or pocket mask, as trained. Perform CPR if necessary. Immediately flush contaminated eyes with gently flowing water. Do not induce vomiting. If vomiting occurs, lean patient forward or place on the left side (head-down position, if possible) to maintain an open airway and prevent aspiration. Keep patient quiet and maintain normal body temperature. Obtain medical attention. /Ammonia and related compounds/

Human Toxicity Excerpts:

>> /HUMAN EXPOSURE STUDIES/ The effect of acidosis on whole body protein turnover was determined from the kinetics of infused L-(1-(13)C) leucine. Seven healthy subjects were studied before (basal) and after (acid) the induction of acidosis with 5 days oral ammonium chloride (basal pH 7.42 +/- 0.01, acid pH 7.35 +/- 0.03). Bicarbonate recovery, measured from the kinetics of infused NaH13CO3, was increased in the acidotic state (basal 72.9 +/- 1.2 vs. acid 77.6 +/- 1.6%; P = 0.06). Leucine appearance from body protein (PD), leucine disappearance into body protein (PS), and leucine oxidation (O) increased significantly (PD: basal 120.5 +/- 5.6 vs. acid 153.9 +/- 6.2, P < 0.01; PS: basal 98.8 +/- 5.6 vs. acid 127.0 +/- 4.7, P < 0.01; O: basal 21.6 +/- 1.1 vs. acid 26.9 +/- 2.3 umol/kg/hr, P < 0.01). Plasma levels of the amino acids threonine, serine, asparagine, citrulline, valine, leucine, ornithine, lysine, histidine, arginine, and hydroxyproline increased significantly with the induction of acidosis. These results confirm that acidosis in humans is a catabolic factor stimulating protein degradation and amino acid oxidation.

Non-Human Toxicity Excerpts:

>> /LABORATORY ANIMALS: Acute Exposure/ In mice intravenous administration ... resulted in hyperventilation and clonic movements which were followed sometimes by tonic extensor convulsions, but usually by profound coma; death was preceded by convulsions, but survivors made complete and rapid recovery. This syndrome /was/ potentiated by short periods of hypoxia ... . /Ammonia/

Non-Human Toxicity Values:

>> LD50 Rat oral 1650 mg/kg

Populations at Special Risk:

>> Ammonium chloride should not be administered to patients with severe hepatic dysfunction, since ammonia toxicity may occur in these patients.

Protein Binding:

In this section, "protein binding" refers to the degree to which medications attach to plasma proteins (i.e., proteins within the blood, such as human serum albumin, lipoprotein, glycoprotein and globulins). A drug's efficiency may be affected by the degree to which it binds to plasma proteins. The less bound a drug is, the more efficiently it can traverse cell membranes or diffuse.

>> Data not found.

12. Ecological Information

ICSC Environmental Data:

>> The substance is toxic to aquatic organisms.

13. Disposal Considerations

Spillage Disposal

>> Personal protection: particulate filter respirator adapted to the airborne concentration of the substance. Sweep spilled substance into covered containers. Wash away remainder with plenty of water.

Disposal Methods

>> SRP: Recycle any unused portion of the material for its approved use or return it to the manufacturer or supplier. Ultimate disposal of the chemical must consider: the material's impact on air quality; potential migration in air, soil or water; effects on animal, aquatic and plant life; and conformance with environmental and public health regulations. If it is possible or reasonable use an alternative chemical product with less inherent propensity for occupational harm/injury/toxicity or environmental contamination.

>> Product: Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

>> Contaminated packaging: Dispose of as unused product.

>> Pretreatment involves addition of sodium hydroxide to liberate ammonia and form the soluble sodium salt. The liberated ammonia can be recovered and sold. After dilution to the permitted provisional limit, the sodium salt can be discharged into a stream or sewer.

>> Group III Containers (both combustible and non-combustible) that previously held organic mercury, lead, cadmium, arsenic, or inorganic pesticides should be triple rinsed, punctured and disposed of in a sanitary landfill. Non-rinsed containers should be encapsulated and buried at a specially designated landfill site. /Organic mercury, lead, cadmium, arsenic, or inorganic pesticides/

14. Transport Information

DOT

Ammonium chloride

Reportable Quantity of 5,000 lb or 2,270 kg

IATA

Ammonium chloride

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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.

>> Ammonium chloride is 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. This designation includes any isomers and hydrates, as well as any solutions and mixtures containing this substance.

Regulatory Information

The Australian Inventory of Industrial Chemicals

>> Chemical: Ammonium chloride ((NH4)Cl)

REACH Registered Substance

>> Status: Active Update: 03-11-2022 https://echa.europa.eu/registration-dossier/-/registered-dossier/15492

New Zealand EPA Inventory of Chemical Status

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

16. Other Information

Toxic Combustion Products:

Toxic products (e.g., gases and vapors) produced from the combustion of this chemical.

>> The substance decomposes on heating producing toxic and irritating fumes (nitrogen oxides, ammonia and hydrogen chloride).

Other Safety Information

Chemical Assessment

>> IMAP assessments - Ammonium chloride ((NH4)Cl): Environment tier I assessment

>> IMAP assessments - Ammonium chloride ((NH4)Cl): 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."