Material Safety Data Sheet

Ammonium carbamate

sc-223777

Section 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME
Ammonium carbamate

STATEMENT OF HAZARDOUS NATURE

NFPA

SUPPLIER
Santa Cruz Biotechnology, Inc.
2145 Delaware Avenue
Santa Cruz, California 95060
800.457.3801 or 831.457.3800

EMERGENCY
ChemWatch
Within the US & Canada: 877-715-9305
Outside the US & Canada: +800 2436 2255
(1-800-CHEMCALL) or call +613 9573 3112

SYNONYMS
CH3N02-NH3, C-H6-N2-O2, H2NCO2NH4, "carbamic acid, ammonium salt", "ammonium aminoformate", "NA 9083"

Section 2 - HAZARDS IDENTIFICATION

CHEMWATCH HAZARD RATINGS

<table>
<thead>
<tr>
<th></th>
<th>Min</th>
<th>Max</th>
</tr>
</thead>
<tbody>
<tr>
<td>Flammability</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Toxicity</td>
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<td></td>
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<tr>
<td>Body Contact</td>
<td>2</td>
<td></td>
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<tr>
<td>Reactivity</td>
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<td></td>
</tr>
<tr>
<td>Chronic</td>
<td>2</td>
<td></td>
</tr>
</tbody>
</table>

Hazard Alert Code
Key:
EXTREME | HIGH | MODERATE | LOW

Min/Nil=0
Low=1
Moderate=2
High=3
Extrem=4
EMERGENCY OVERVIEW
RISK
Harmful if swallowed.
Irritating to eyes, respiratory system and skin.

POTENTIAL HEALTH EFFECTS

ACUTE HEALTH EFFECTS

SWALLOWED
- Accidental ingestion of the material may be harmful; animal experiments indicate that ingestion of less than 150 gram may be fatal or may produce serious damage to the health of the individual.
- Large doses of ammonia or injected ammonium salts may produce diarrhoea and may be sufficiently absorbed to produce increased production of urine and systemic poisoning.
Symptoms include weakening of facial muscle, tremor, anxiety, reduced muscle and limb control.

EYE
- This material can cause eye irritation and damage in some persons.

SKIN
- This material can cause inflammation of the skin on contact in some persons.
- The material may accentuate any pre-existing dermatitis condition.
- Open cuts, abraded or irritated skin should not be exposed to this material.
- Solution of material in moisture on the skin, or perspiration, may markedly increase skin corrosion and accelerate tissue destruction.
- Entry into the blood-stream, through, for example, cuts, abrasions or lesions, may produce systemic injury with harmful effects.
Examine the skin prior to the use of the material and ensure that any external damage is suitably protected.

INHALED
- The material can cause respiratory irritation in some persons.
The body's response to such irritation can cause further lung damage.
- Persons with impaired respiratory function, airway diseases and conditions such as emphysema or chronic bronchitis, may incur further disability if excessive concentrations of particulate are inhaled.
If prior damage to the circulatory or nervous systems has occurred or if kidney damage has been sustained, proper screenings should be conducted on individuals who may be exposed to further risk if handling and use of the material result in excessive exposures.
- The highly irritant properties of ammonia vapor result as the gas dissolves in mucous fluids and forms irritant, even corrosive solutions.
Inhalation of the ammonia fumes causes coughing, vomiting, reddening of lips, mouth, nose, throat and conjunctiva while higher concentrations can cause temporary blindness, restlessness, tightness in the chest, pulmonary oedema (lung damage), weak pulse and cyanosis.
- Vapour may be a severe discomfort if prolonged inhalation of high concentrations occurs.

CHRONIC HEALTH EFFECTS
- Long-term exposure to respiratory irritants may result in disease of the airways involving difficult breathing and related systemic problems.
Substance accumulation, in the human body, may occur and may cause some concern following repeated or long-term occupational exposure.
Long term exposure to high dust concentrations may cause changes in lung function i.e. pneumoconiosis; caused by particles less than 0.5 micron penetrating and remaining in the lung. Prime symptom is breathlessness; lung shadows show on X-ray.
Prolonged or repeated minor exposure to ammonia gas/vapor may cause long-term irritation to the eyes, nose and upper respiratory tract. Repeated exposure or prolonged contact may produce dermatitis, and conjunctivitis. Ammonia resulting from decomposition or following application of heat, represents the other major occupational exposure hazard.

### Section 3 - COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>NAME</th>
<th>CAS RN</th>
<th>%</th>
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<tbody>
<tr>
<td>ammonium carbamate</td>
<td>1111-78-0</td>
<td>&gt;95</td>
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<tr>
<td>gradually decomposes in air and emits</td>
<td></td>
<td></td>
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<tr>
<td>ammonia</td>
<td>1336-21-6</td>
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</table>

### Section 4 - FIRST AID MEASURES

**SWALLOWED**
- IF SWALLOWED, REFER FOR MEDICAL ATTENTION, WHERE POSSIBLE, WITHOUT DELAY.
- For advice, contact a Poisons Information Centre or a doctor.
- Urgent hospital treatment is likely to be needed.
- In the mean time, qualified first-aid personnel should treat the patient following observation and employing supportive measures as indicated by the patient's condition.

**EYE**
If this product comes in contact with the eyes
- Wash out immediately with fresh running water.
- Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.
- Seek medical attention without delay; if pain persists or recurs seek medical attention.
- Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

**SKIN**
If skin contact occurs
- Immediately remove all contaminated clothing, including footwear.
- Flush skin and hair with running water (and soap if available).
- Seek medical attention in event of irritation.

**INHALED**
- If fumes or combustion products are inhaled remove from contaminated area.
- Lay patient down. Keep warm and rested.
- Prostheses such as false teeth, which may block airway, should be removed, where possible, prior to initiating first aid procedures.
- Apply artificial respiration if not breathing, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.

**NOTES TO PHYSICIAN**
- for irritant gas exposures
  - the presence of the agent when it is inhaled is evanescent (of short duration) and therefore, cannot be washed away or otherwise removed
  - arterial blood gases are of primary importance to aid in determination of the extent of damage. Never discharge a patient significantly exposed to an irritant gas without obtaining an arterial blood sample.
  - supportive measures include suctioning (intubation may be required), volume cycle ventilator support (positive and expiratory pressure (PEEP), steroids and antibiotics, after a culture is taken
  - If the eyes are involved, an ophthalmologic consultation is recommended
For acute or short term repeated exposures to ammonia and its solutions
- Mild to moderate inhalation exposures produce headache, cough, bronchospasm, nausea, vomiting, pharyngeal and retrosternal pain and conjunctivitis. Severe inhalation produces laryngospasm, signs of upper airway obstruction (stridor, hoarseness, difficulty in speaking) and, in excessively, high doses, pulmonary
oedema.
• Warm humidified air may soothe bronchial irritation.
• Test all patients with conjunctival irritation for corneal abrasion (fluorescein stain, slit lamp exam)
• Dyspneic patients should receive a chest X-ray and arterial blood gases to detect pulmonary oedema.

### Section 5 - FIRE FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
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</thead>
<tbody>
<tr>
<td>Vapor Pressure (mmHg)</td>
<td>99.758 @ 26.7 C</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>25</td>
</tr>
<tr>
<td>Specific Gravity (water=1)</td>
<td>Not available</td>
</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>16</td>
</tr>
</tbody>
</table>

#### EXTINGUISHING MEDIA
- Water spray or fog.
- Foam.
- Dry chemical powder.
- BCF (where regulations permit).

#### FIRE FIGHTING
- Alert Fire Brigade and tell them location and nature of hazard.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or water courses.
- Use water delivered as a fine spray to control fire and cool adjacent area.

#### GENERAL FIRE HAZARDS/HAZARDOUS COMBUSTIBLE PRODUCTS
- Combustible solid which burns but propagates flame with difficulty; it is estimated that most organic dusts are combustible (circa 70%) - according to the circumstances under which the combustion process occurs, such materials may cause fires and / or dust explosions.
- Avoid generating dust, particularly clouds of dust in a confined or unventilated space as dusts may form an explosive mixture with air, and any source of ignition, i.e. flame or spark, will cause fire or explosion. Dust clouds generated by the fine grinding of the solid are a particular hazard; accumulations of fine dust (420 micron or less) may burn rapidly and fiercely if ignited - particles exceeding this limit will generally not form flammable dust clouds.; once initiated, however, larger particles up to 1400 microns diameter will contribute to the propagation of an explosion.
- In the same way as gases and vapors, dusts in the form of a cloud are only ignitable over a range of concentrations; in principle, the concepts of lower explosive limit (LEL) and upper explosive limit (UEL).are applicable to dust clouds but only the LEL is of practical use; - this is because of the inherent difficulty of achieving homogeneous dust clouds at high temperatures (for dusts the LEL is often called the "Minimum Explosible Concentration", MEC)
- A dust explosion may release of large quantities of gaseous products; this in turn creates a subsequent pressure rise of explosive force capable of damaging plant and buildings and injuring people.
- Combustion products include carbon monoxide (CO), carbon dioxide (CO2), nitrogen oxides (NOx), other pyrolysis products typical of burning organic material.
- May emit poisonous fumes.
- May emit corrosive fumes.

#### FIRE INCOMPATIBILITY
- Avoid contamination with oxidising agents i.e. nitrates, oxidising acids, chlorine bleaches, pool chlorine etc. as ignition may result

### Section 6 - ACCIDENTAL RELEASE MEASURES

#### MINOR SPILLS
- Remove all ignition sources.
- Clean up all spills immediately.
- Avoid contact with skin and eyes.
- Control personal contact by using protective equipment.
MAJOR SPILLS
Moderate hazard.
- CAUTION Advise personnel in area.
- Alert Emergency Services and tell them location and nature of hazard.
- Control personal contact by wearing protective clothing.
- Prevent, by any means available, spilage from entering drains or water courses.

Section 7 - HANDLING AND STORAGE

PROCEDURE FOR HANDLING
- Avoid all personal contact, including inhalation.
- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.
Empty containers may contain residual dust which has the potential to accumulate following settling. Such dusts may explode in the presence of an appropriate ignition source.
- Do NOT cut, drill, grind or weld such containers.
- In addition ensure such activity is not performed near full, partially empty or empty containers without appropriate workplace safety authorisation or permit.

RECOMMENDED STORAGE METHODS
- Glass container is suitable for laboratory quantities
- Polyethylene or polypropylene container.
- Check all containers are clearly labelled and free from leaks.

STORAGE REQUIREMENTS
- Store in original containers.
- Keep containers securely sealed.
- Store in a cool, dry, well-ventilated area.
- Store away from incompatible materials and foodstuff containers.

Section 8 - EXPOSURE CONTROLS / PERSONAL PROTECTION

EXPOSURE CONTROLS

<table>
<thead>
<tr>
<th>Source</th>
<th>Material</th>
<th>TWA ppm</th>
<th>TWA mg/m³</th>
<th>STEL ppm</th>
<th>STEL mg/m³</th>
<th>Peak ppm</th>
<th>Peak mg/m³</th>
<th>TWA F/CC</th>
<th>Notes</th>
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<tr>
<td>Canada - Ontario Occupational Exposure Limits</td>
<td>ammonium carbamate (Particles (Insoluble or Poorly Soluble) Not Otherwise)</td>
<td>10 (I)</td>
<td></td>
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5 of 13
<table>
<thead>
<tr>
<th>Location</th>
<th>Substance</th>
<th>Limit</th>
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<tr>
<td>US - Tennessee</td>
<td>ammonium carbamate</td>
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<tr>
<td>Occupational</td>
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<tr>
<td>Exposure Limits</td>
<td>regulated Respirable</td>
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<tr>
<td>Limits For Air</td>
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<tr>
<td>Contaminants</td>
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<td>Permissible</td>
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<tr>
<td>Exposure Limits</td>
<td>regulated Respirable</td>
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<tr>
<td>for Chemical</td>
<td>fraction)</td>
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<tr>
<td>Contaminants</td>
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<tr>
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<td>Bold print identifies substances for which the Oregon Permissible</td>
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<tr>
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<td>Exposure Limits (PELs) are different than the federal Limits. PNOR</td>
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<td>Exposure Limits</td>
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<td>means &quot;particles not otherwise regulated.&quot;</td>
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<td>(Z-1)</td>
<td>Dust)</td>
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<td>Substances Table</td>
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<td>Z1 Limits for Air</td>
<td>Contaminants</td>
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<tr>
<td>Location/Standard</td>
<td>Substance</td>
<td>Limit 1</td>
<td>Limit 2</td>
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<td>Canada - Yukon Permissible Concentrations for Airborne Contaminant Substances</td>
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<td>US - Minnesota Permissible Exposure Limits (PELs)</td>
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<td>US - Tennessee Occupational Exposure Limits - Limits For Air Contaminants</td>
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<td>US - Vermont Permissible Exposure Limits Table Z-1-A Transitional Limits for Air Contaminants</td>
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<td>US - Vermont Permissible Exposure Limits Table Z-1-A Final Rule Limits for Air Contaminants</td>
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<td>US - California Permissible Exposure Limits for Chemical Contaminants</td>
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<td>Substance</td>
<td>Lower Limit</td>
<td>Upper Limit</td>
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<td>US - Idaho - Limits for Air Contaminants</td>
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<td>US ACGIH Threshold Limit Values (TLV)</td>
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<td>US - Alaska Limits for Air Contaminants</td>
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<td>Canada - Northwest Territories Occupational Exposure Limits (English)</td>
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<td>Canada - Quebec Permissible Exposure Values for Airborne Contaminants (English)</td>
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<td>US OSHA Permissible Exposure Levels (PELs) - Table Z1</td>
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Canada - Prince Edward Island
Occupational Exposure Limits

<table>
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<tr>
<th>Substance</th>
<th>TLV® Basis</th>
<th>Eye dam</th>
<th>URT irr</th>
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<tr>
<td>ammonia</td>
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US - Wyoming
Toxic and Hazardous Substances Table
Z1 Limits for Air Contaminants

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<th>TLV® Basis</th>
<th>Eye dam</th>
<th>URT irr</th>
</tr>
</thead>
<tbody>
<tr>
<td>ammonia</td>
<td>50</td>
<td>35</td>
<td></td>
</tr>
</tbody>
</table>

PERSONAL PROTECTION

RESPIRATOR
• Type K-P Filter of sufficient capacity. (AS/NZS 1716 & 1715, EN 1432000 & 1492001, ANSI Z88 or national equivalent)

EYE
• Safety glasses with side shields.
• Chemical goggles.
• Contact lenses may pose a special hazard; soft contact lenses may absorb and concentrate irritants. A written policy document, describing the wearing of lens or restrictions on use, should be created for each workplace or task. This should include a review of lens absorption and adsorption for the class of chemicals in use and an account of injury experience. Medical and first-aid personnel should be trained in their removal and suitable equipment should be readily available. In the event of chemical exposure, begin eye irrigation immediately and remove contact lens as soon as practicable. Lens should be removed at the first signs of eye redness or irritation - lens should be removed in a clean environment only after workers have washed hands thoroughly. [CDC NIOSH Current Intelligence Bulletin 59], [AS/NZS 1336 or national equivalent]

HANDS/FEET
Suitability and durability of glove type is dependent on usage. Important factors in the selection of gloves include
• frequency and duration of contact,
• chemical resistance of glove material,
• glove thickness and dexterity
Experience indicates that the following polymers are suitable as glove materials for protection against undissolved, dry solids, where abrasive particles are not present.
• polychloroprene
• nitrile rubber
• butyl rubber
• fluorocaooutchouc

OTHER
• Overalls.
• P.V.C. apron.
• Barrier cream.
• Skin cleansing cream.

ENGINEERING CONTROLS
CARE Explosive vapor air mixtures may be present on opening vessels which have contained liquid ammonia. Fatalities have occurred.
Engineering controls are used to remove a hazard or place a barrier between the worker and the hazard. Well-designed engineering controls can be highly effective in protecting workers and will typically be independent
of worker interactions to provide this high level of protection.
The basic types of engineering controls are:
Process controls which involve changing the way a job activity or process is done to reduce the risk.
Enclosure and/or isolation of emission source which keeps a selected hazard “physically” away from the worker and ventilation that strategically “adds” and “removes” air in the work environment.

**Section 9 - PHYSICAL AND CHEMICAL PROPERTIES**

**PHYSICAL PROPERTIES**
Solid.
Mixes with water.

<table>
<thead>
<tr>
<th>State</th>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Melting Range (°F)</td>
<td>Divided solid</td>
<td>140 sublimes</td>
</tr>
<tr>
<td>Boiling Range (°F)</td>
<td>Solubility in water (g/L)</td>
<td>Miscible</td>
</tr>
<tr>
<td>Flash Point (°F)</td>
<td>pH (1% solution)</td>
<td>&gt;7</td>
</tr>
<tr>
<td>Decomposition Temp (°F)</td>
<td>pH (as supplied)</td>
<td>Not applicable</td>
</tr>
<tr>
<td>Autoignition Temp (°F)</td>
<td>Vapor Pressure (mmHg)</td>
<td>99.758 @ 26.7°C</td>
</tr>
<tr>
<td>Upper Explosive Limit (%)</td>
<td>Specific Gravity (water=1)</td>
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</tr>
<tr>
<td>Lower Explosive Limit (%)</td>
<td>Relative Vapor Density (air=1)</td>
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</tr>
<tr>
<td>Volatile Component (%vol)</td>
<td>Evaporation Rate</td>
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</tbody>
</table>

**APPEARANCE**
Crystalline powder with ammonia odor; mixes with water. Gradually loses ammonia in air changing to ammonium carbonate. Volatilises at 60 deg C.

**Section 10 - CHEMICAL STABILITY**

**CONDITIONS CONTRIBUTING TO INSTABILITY**
- Presence of incompatible materials.
- Product is considered stable.
- Hazardous polymerisation will not occur.

**STORAGE INCOMPATIBILITY**
- For ammonia
  - Ammonia forms explosive mixtures with oxygen, chlorine, bromine, fluorine, iodine, mercury, platinum and silver.
  - Fire and/or explosion may follow contact with acetaldehyde, acrolein, aldehydes, alkylene oxides, amides, antimony, boron, boron halides, bromine chloride, chloric acid, chlorine monoxide, o-chloronitrobenzene, 1-chloro-2,4-nitrobenzene, chlorosilane, chloromelamine, chromium trioxide, chromyl chloride, epichlorohydrin, hexachloromelamine, hypochlorites (do NOT mix ammonia with liquid household bleach), isocyanates, nitrogen tetraoxide, nitrogen trichloride, nitryl chloride, organic anhydrides, phosphorous trioxide, potassium ferricyanide, potassium mercuric cyanide, silver chloride, stibine, tellurium halides, tellurium hydropentachloride, tetramethylammonium amide, trimethylammonium amide, trioxylene difluoride, vinyl acetate.
  - Shock-, temperature-, and pressure sensitive compounds are formed with antimony, chlorine, germanium compounds, halogens, heavy metals, hydrocarbons, mercury oxide, silver compounds (azides, chlorides, nitrates, oxides).
  - Vapours or solutions of ammonia are corrosive to copper, copper alloys, galvanised metal and aluminium. Mixtures of ammonia and air lying within the explosive limits can occur above aqueous solutions of varying strengths.
  - Avoid reaction with oxidising agents

Avoid storage with oxidising agents, strong acids and strong bases. Protect from moisture as decomposition may occur with evolution of ammonia.
ammonium carbamate

**TOXICITY AND IRRITATION**

unless otherwise specified data extracted from RTECS - Register of Toxic Effects of Chemical Substances. Asthma-like symptoms may continue for months or even years after exposure to the material ceases. This may be due to a non-allergenic condition known as reactive airways dysfunction syndrome (RADS) which can occur following exposure to high levels of highly irritating compound.

**AMMONIUM CARBAMATE AMMONIA AMMONIA**

No significant acute toxicological data identified in literature search.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

**CARCINOGEN**

| ammonia | US - Rhode Island Hazardous Substance List | IARC |

**Section 12 - ECOLOGICAL INFORMATION**

No data

**Section 13 - DISPOSAL CONSIDERATIONS**

**Disposal Instructions**

All waste must be handled in accordance with local, state and federal regulations.

- Containers may still present a chemical hazard/ danger when empty.
- Return to supplier for reuse/ recycling if possible.

Otherwise:

- If container can not be cleaned sufficiently well to ensure that residuals do not remain or if the container cannot be used to store the same product, then puncture containers, to prevent re-use, and bury at an authorised landfill.
- Where possible retain label warnings and MSDS and observe all notices pertaining to the product.

Legislation addressing waste disposal requirements may differ by country, state and/ or territory. Each user must refer to laws operating in their area. In some areas, certain wastes must be tracked.

A Hierarchy of Controls seems to be common - the user should investigate:

- Reduction
- Reuse
- Recycling
- Disposal (if all else fails)

This material may be recycled if unused, or if it has not been contaminated so as to make it unsuitable for its intended use. Shelf life considerations should also be applied in making decisions of this type. Note that properties of a material may change in use, and recycling or reuse may not always be appropriate. In most instances the supplier of the material should be consulted.

- DO NOT allow wash water from cleaning or process equipment to enter drains.
- It may be necessary to collect all wash water for treatment before disposal.
- In all cases disposal to sewer may be subject to local laws and regulations and these should be considered first.
- Where in doubt contact the responsible authority.
- Recycle wherever possible.
- Consult manufacturer for recycling options or consult local or regional waste management authority for disposal if no suitable treatment or disposal facility can be identified.
- Dispose of by: burial in a land-fill specifically licenced to accept chemical and / or pharmaceutical wastes or Incineration in a licenced apparatus (after admixture with suitable combustible material)
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.

Section 14 - TRANSPORTATION INFORMATION

NOT REGULATED FOR TRANSPORT OF DANGEROUS GOODS: DOT, IATA, IMDG

Section 15 - REGULATORY INFORMATION

ammonium carbamate (CAS: 1111-78-0) is found on the following regulatory lists;

Regulations for ingredients

ammonia (CAS: 1336-21-6) is found on the following regulatory lists;

Section 16 - OTHER INFORMATION

LIMITED EVIDENCE

- Cumulative effects may result following exposure*.
  * (limited evidence).

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its use. For additional technical information please call our toxicology department on +800 CHEMCALL.

- Classification of the preparation and its individual components has drawn on official and authoritative sources as well as independent review by the Chemwatch Classification committee using available literature references. A list of reference resources used to assist the committee may be found at: www.chemwatch.net/references.

- The (M)SDS is a Hazard Communication tool and should be used to assist in the Risk Assessment. Many factors determine whether the reported Hazards are Risks in the workplace or other settings.

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