3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Can decompose at high temperatures forming toxic gases. Contents may develop pressure on prolonged exposure to heat. See "Other Health Effects" Section.

POTENTIAL HEALTH EFFECTS

Inhalation: Prolonged or repeated overexposure to mists may cause mild respiratory irritation. Excessive contact with mist or spray may cause irritation of mucous membranes, coughing and difficulty in breathing. See "Other Health Effects" Section.

Skin Contact: Skin contact can cause irritation, especially under the finger nails (and other confined spaces such as under rings or watch bands). May cause defatting, drying and cracking of the skin. Prolonged and repeated contact may lead to dermatitis.

Skin Absorption: Not likely to be absorbed through the skin.

Eye Contact: Causes eye irritation. Burns can occur if not promptly removed.

Ingestion: This product causes irritation, a burning sensation of the mouth and throat and abdominal pain.

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS#</th>
<th>ACGIH TLV (TWA)</th>
<th>% Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>57-13-6</td>
<td>---</td>
<td>30 - 60</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

FIRST AID PROCEDURES

Inhalation: If respiratory problems arise, move the victim to fresh air. Give artificial resuscitation ONLY if breathing has stopped. Give cardiopulmonary resuscitation (CPR) if there is no breathing AND no pulse. Obtain medical advice IMMEDIATELY.

Skin Contact: Flush skin with running water for a minimum of 20 minutes. Start flushing while removing contaminated clothing. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.

Eye Contact: Immediately flush eyes with running water for a minimum of 20 minutes. Hold eyelids open during flushing. Take care not to rinse contaminated water into the unaffected eye or onto the face. If irritation persists, repeat flushing. Obtain medical attention IMMEDIATELY.

Ingestion: Do not attempt to give anything by mouth to an unconscious person. If victim is alert and not convulsing, rinse mouth out and give 1/2 to 1 glass of water to dilute material. DO NOT induce vomiting. If spontaneous vomiting occurs, have victim lean forward with head down to avoid breathing in of vomitus, rinse mouth and administer more water. Obtain medical attention IMMEDIATELY.

Medical conditions that may be aggravated by exposure to this product include diseases of the skin, eyes or respiratory tract.

Note to Physicians: Effects (irritancy) on the skin and eyes may be delayed, and damage may occur without the sensation or onset of pain. Strict adherence to first aid measures following any exposure is essential.

Solutions are corrosive to most metals. Urea forms corrosive solutions when dissolved in water. High blood concentration of urea increases the risk of glaucoma. May induce osmotic diuresis. Osmotic diuresis is a condition caused by a high concentration of osmotically active substances in the renal tubules (Urea, Sodium Sulphate), which limit the reabsorption of water. (8) May cause central nervous system (CNS) depression. CNS depression is characterized by headache, dizziness, drowsiness, nausea, vomiting and incoordination. Severe overexposures may lead to coma and possible death due to respiratory failure.

Anecdotal evidence has shown that the development of first and second degree burns to skin may result from delayed implementation of first aid measures, especially if the liquid material is held in close contact with the skin by contaminated clothing for prolonged periods of time. (6)

See Section 11, "Other Studies Relevant to Material".

5. FIRE-FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Flashpoint (*°C)</th>
<th>Autolignition Temperature (*°C)</th>
<th>Flammability Limits in Air (%):</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-combustible (does not burn).</td>
<td>Not applicable.</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>Flammability Class (WHMIS):</td>
<td>Not regulated.</td>
<td></td>
</tr>
<tr>
<td>Hazardous Combustion Products:</td>
<td>Thermal decomposition products are toxic and may include Ammonia, cyanuric acid, biuret, cyanic acid, oxides of carbon, nitrogen and irritating gases.</td>
<td></td>
</tr>
<tr>
<td>Unusual Fire or Explosion Hazards:</td>
<td>Closed containers exposed to heat may burst. Spilled material may cause floors and contact surfaces to become slippery.</td>
<td></td>
</tr>
<tr>
<td>Urea: Hypochlorites may react with primary amines to form nitrogen trichloride which explodes spontaneously in air.</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Sensitivity to Mechanical Impact:</td>
<td>Not expected to be sensitive to mechanical impact.</td>
<td></td>
</tr>
<tr>
<td>Rate of Burning:</td>
<td>Not available.</td>
<td></td>
</tr>
<tr>
<td>Explosive Power:</td>
<td>Not available.</td>
<td></td>
</tr>
<tr>
<td>Sensitivity to Static Discharge:</td>
<td>Not expected to be sensitive to static discharge.</td>
<td></td>
</tr>
</tbody>
</table>

EXTINGUISHING MEDIA
### 6. ACCIDENTAL RELEASE MEASURES

Information in this section is for responding to spills, leaks or releases in order to prevent or minimize the adverse effects on persons, property and the environment. There may be specific reporting requirements associated with spills, leaks or releases, which change from region to region.

#### Containment and Clean-Up Procedures:

In all cases of leak or spill contact vendor at Emergency Number shown on the front page of this MSDS. Wear protective clothing. Recover spilled material on non-combustible absorbents, such as sand or vermiculite, and place in covered containers for disposal. Collect product for recovery or disposal. For release to land, or storm water runoff, contain discharge by constructing dikes or applying inert absorbent; for release to water, utilize damming and/or water diversion to minimize the spread of contamination. Ventilate enclosed spaces. Notify applicable government authority if release is reportable or could adversely affect the environment. Spilled material may cause floors and contact surfaces to become slippery.

### 7. HANDLING AND STORAGE

#### HANDLING

**Handling Practices:**

Use normal "good" industrial hygiene and housekeeping practices. Containers exposed to heat may be under internal pressure. These should be cooled and carefully vented before opening. A face shield and apron should be worn. Vent container frequently, and more often in warm weather, to relieve pressure.

**Ventilation Requirements:**

See Section 8, "Engineering Controls".

**Other Precautions:**

Use only with adequate ventilation and avoid breathing aerosols (vapours or mists). Avoid contact with eyes, skin or clothing. Wash thoroughly with soap and water after handling. Wash contaminated clothing thoroughly before re-use.

#### STORAGE

**Storage Temperature (°C):**

See below.

**Ventilation Requirements:**

General exhaust is acceptable.

**Storage Requirements:**

Store in a cool, well-ventilated area. Keep away from heat, sparks and flames. Keep containers closed. Do not expose sealed containers to temperatures above 40° C.

**Special Materials to be Used for Packaging or Containers:**

Confirm suitability of any material before using.

### 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Recommendations listed in this section indicate the type of equipment, which will provide protection against overexposure to this product. Conditions of use, adequacy of engineering or other control measures, and actual exposures will dictate the need for specific protective devices at your workplace.

#### ENGINEERING CONTROLS

**Engineering Controls:**

General exhaust is acceptable. Local exhaust ventilation preferred. Make up air should be supplied to balance air that is removed by local or general exhaust ventilation. Ventilate low lying areas such as sumps or pits where dense vapours may collect.

#### PERSONAL PROTECTIVE EQUIPMENT (PPE)

**Eye Protection:**

Safety glasses with side shields are recommended to prevent eye contact. Use full face-shield or chemical safety goggles when there is potential for contact. Contact lenses should not be worn when working with this material.

**Skin Protection:**

Gloves and protective clothing made from butyl rubber, natural rubber, nitrile rubber or PVC should be impervious under conditions of use. Do not use gloves or protective clothing made from leather. Prior to use, user should confirm impermeability. Discard contaminated gloves.
Respiratory Protection: No specific guidelines available. Respiratory protection should not be necessary unless a mist is created. A NIOSH/MSHA-approved air-purifying respirator equipped with organic vapour cartridges for concentrations up to 1000 ppm organic vapours. Use an air-supplied respirator if concentrations are high or unknown.

If while wearing a respiratory protection, you can smell, taste or otherwise detect anything unusual, or in the case of a full facepiece respirator you experience eye irritation, leave the area immediately. Check to make sure the respirator to face seal is still good. If it is, replace the filter, cartridge or canister. If the seal is no longer good, you may need a new respirator.

Other Personal Protective Equipment: Wear regular work clothing. The use of coveralls is recommended. Locate safety shower and eyewash station close to chemical handling area. Take all precautions to avoid personal contact.

EXPOSURE GUIDELINES
None established for this product.

9. PHYSICAL AND CHEMICAL PROPERTIES (Not intended as Specifications)

<table>
<thead>
<tr>
<th>Physical State:</th>
<th>Liquid.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance:</td>
<td>Colourless to slightly hazy liquid.</td>
</tr>
<tr>
<td>Odour:</td>
<td>Ammonia odour.</td>
</tr>
<tr>
<td>Odour Threshold (ppm):</td>
<td>Not available.</td>
</tr>
<tr>
<td>Boiling Range (°C):</td>
<td>104 - 106 (3)</td>
</tr>
<tr>
<td>Melting/Freezing Point (°C):</td>
<td>Not available.</td>
</tr>
<tr>
<td>Vapour Pressure (mm Hg at 20° C):</td>
<td>Not available.</td>
</tr>
<tr>
<td>Vapour Density (Air = 1.0):</td>
<td>Not available.</td>
</tr>
<tr>
<td>Relative Density (g/cc):</td>
<td>1.08 - 1.14 (3)</td>
</tr>
<tr>
<td>Bulk Density:</td>
<td>Not available.</td>
</tr>
<tr>
<td>Viscosity:</td>
<td>Not available.</td>
</tr>
<tr>
<td>Evaporation Rate (Butyl Acetate = 1.0):</td>
<td>Not available.</td>
</tr>
<tr>
<td>Solubility:</td>
<td>100%</td>
</tr>
<tr>
<td>% Volatile by Volume:</td>
<td>Not available.</td>
</tr>
<tr>
<td>pH:</td>
<td>9.8 - 10 (3)</td>
</tr>
<tr>
<td>Coefficient of Water/Oil Distribution:</td>
<td>Not available.</td>
</tr>
<tr>
<td>Volatile Organic Compounds (VOC):</td>
<td>Not available.</td>
</tr>
<tr>
<td>Flashpoint (°C):</td>
<td>Non-combustible (does not burn).</td>
</tr>
</tbody>
</table>

10. STABILITY AND REACTIVITY

CHEMICAL STABILITY
Under Normal Conditions: Stable.
Under Fire Conditions: Not flammable.
Hazardous Polymerization: Will not occur.
Conditions to Avoid: High temperatures, sparks, open flames and all other sources of ignition. Do not evaporate to dryness.

Decomposition or Combustion Products: Thermal decomposition products are toxic and may include Ammonia, cyanuric acid, biuret, cyanic acid, oxides of carbon, nitrogen and irritating gases.

11. TOXICOLOGICAL INFORMATION
TOXICOLOGICAL DATA:

<table>
<thead>
<tr>
<th>SUBSTANCE</th>
<th>LD50 (Oral, Rat)</th>
<th>LD50 (Dermal, Rabbit)</th>
<th>LC50 (Inhalation, Rat, 4h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Urea</td>
<td>8 471 - 14 300 mg/kg (1,3)</td>
<td>---</td>
<td>---</td>
</tr>
</tbody>
</table>

Carcinogenicity Data: The ingredient(s) of this product is (are) not classed as carcinogenic by ACGIH, IARC, OSHA or NTP.

Reproductive Data: No adverse reproductive effects are anticipated.

Mutagenicity Data: No adverse mutagenic effects are anticipated.

Teratogenicity Data: No adverse teratogenic effects are anticipated.

Respiratory / Skin Sensitization Data: None known.

Synergistic Materials: Application of urea to guinea pig skin increased a subsequent sensitization reaction to epoxy resins. (4)

Other Studies Relevant to Material:

- Application of a saturated urea solution to rabbit eyes caused the loss of corneal epithelium after 5 minutes, with slow regeneration. Application of a 10 % solution to human eyes, several times a day, for one year caused no irritation or discomfort. (4)
- Male and female rats were administered a 0.45 %, 0.9 % or 4.5 % (approximately 225, 450 or 2,250 mg/Kg/day) urea in the diet with no adverse effects. (4)
- Bacterial reverse mutation assay- Negative ; Chinese Hamster -Chromosomal aberration test - Positive (very high dose); Mouse -positive (very high dose). (3)
- No toxic effects on mouse gonads up to 6,750-mg/kg day. No toxic effects on rat gonads up to 2,250-mg/kg day. (3)

12. ECOLOGICAL INFORMATION

Ecotoxicity: Will slowly release ammonia and degrade to nitrate. Ammonia is toxic to fish. However, ammonia release is slow making urea much less toxic than ammonium salts. Non-persistent and non-cumulative when applied using normal agricultural practices. The product itself and its products of degradation are not harmful under normal conditions of careful and responsible use. Urea will promote algae growth and may degrade the quality and taste of water. (3)

Urea:

- 96-hour LC50 (Barillius barna) > 9 100 mg/L. (3)
- 48-hour EC50 (Daphnia magna) 3 910 mg/L. (3)

Environmental Fate: Can be dangerous if allowed to enter drinking water intakes. Do not contaminate domestic or irrigation water supplies, lakes, streams, ponds, or rivers.

Urea: When released to soil, Urea will hydrolyze into ammonium in a matter of days to several weeks. When released into the soil, Urea may leach into groundwater. When released into water, Urea may biodegrade to a moderate extent. When released into water, Urea is not expected to evaporate significantly. This material has an experimentally-determined bioconcentration factor (BCF) of less than 100. Urea is not expected to significantly bioaccumulate. When released into the air, Urea is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, Urea is expected to have a half-life of less than 1 day. (3)

13. DISPOSAL CONSIDERATIONS

Deactivating Chemicals: None required.

Waste Disposal Methods: This information applies to the material as manufactured. Reevaluation of the product may be required by the user at the time of disposal since the product uses, transformations, mixtures and processes may influence waste classification. Dispose of waste material at an approved (hazardous) waste treatment/disposal facility in accordance with applicable local, provincial and federal regulations. Do not dispose of waste with normal garbage, or to sewer systems.

Safe Handling of Residues: See "Waste Disposal Methods".

Disposal of Packaging: Empty containers retain product residue. Empty drums should be completely drained, properly bunged and promptly returned to a drum reconditioner. Do not dispose of package until thoroughly washed out.
14. TRANSPORTATION INFORMATION

CANADIAN TDG ACT SHIPPING DESCRIPTION:

This product is not regulated by TDG.

Label(s): Not applicable.  Placard: Not applicable.

ERAP Index: -----.

Exemptions: None known.

This product is transported warm (25 to 35 Degrees Celsius). Storage and shipping requires insulated tanks and tank cars to prevent crystallization of urea.

US DOT CLASSIFICATION (49CFR 172.101, 172.102):

This product is not regulated by DOT.

Label(s): Not applicable.  Placard: Not applicable.

CERCLA-RQ: Not available.  Exemptions: None known.

This product is transported warm (25 to 35 Degrees Celsius). Storage and shipping requires insulated tanks and tank cars to prevent crystallization of urea.

15. REGULATORY INFORMATION

CANADA

CEPA - NSNR: All components of this product are included on the DSL.

CEPA - NPRI: Not included.

Controlled Products Regulations Classification (WHMIS):

D-2B: Toxic (skin and eye irritant)

USA

Environmental Protection Act: All components of this product are included on the TSCA inventory.


NFPA: 2 Health, 0 Fire, 0 Reactivity (3)

HMIS: 2 Health, 0 Fire, 0 Reactivity (3)

INTERNATIONAL

Urea is found on the following inventories: EINECS (European Inventory of Existing Commercial Chemical Substances).

16. OTHER INFORMATION

REFERENCES

1. RTECS-Registry of Toxic Effects of Chemical Substances, Canadian Centre for Occupational Health and Safety RTECS database.


3. Supplier's Material Safety Data Sheet(s).

4. CHEMINFO chemical profile, Canadian Centre for Occupational Health and Safety, Hamilton, Ontario, Canada.


6. Regulatory Affairs Group, Brenntag Canada Inc.


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