SAFETY DATA SHEET

1 PRODUCT AND COMPANY IDENTIFICATION

Product name: Ammonium Hydroxide 29%
Product No.: 9731-14, 9731-03, 9731-23

Manufacturer:
Avantor Performance Materials, Inc.
3477 Corporate Parkway, Suite 200
Center Valley, PA 18034

Telephone:
Customer Service: 855-282-6867

Contact Person:

2 HAZARDS IDENTIFICATION

Emergency Overview:

Appearance:
Color: Colorless
Form: Liquid
Odor: Odorless

Signal words: DANGER!

Potential Health Effects:
General: Corrosive Causes severe skin and eye burns. Harmful if swallowed. Causes digestive tract burns.

Inhalation: Harmful if inhaled.
Skin: Causes severe skin burns.
Eye: May cause chemical eye burns.
Ingestion: Harmful if swallowed. May cause burns of the gastrointestinal tract if swallowed.

Routes of Exposure: Skin and/or eye contact., Inhalation, Ingestion

OSHA Regulatory Status: This product is hazardous according to OSHA 29CFR 1910.1200.

Environment: This material is a strongly alkaline aqueous solution, and this property may cause adverse environmental effects. Expected to be very toxic to aquatic organisms. May cause long-term adverse effects in the environment.
COMPOSITION / INFORMATION ON INGREDIENTS

General information:

Hazardous Component(s):

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA</td>
<td>7664-41-7</td>
<td>15 - 35%</td>
</tr>
<tr>
<td>WATER</td>
<td>7732-18-5</td>
<td>65 - 85%</td>
</tr>
</tbody>
</table>

* All concentrations are percent by weight unless ingredient is a gas. Gas concentrations are in percent by volume.

FIRST AID MEASURES

General:
Get medical advice/attention if you feel unwell. If medical advice is needed, have product container or label at hand.

Inhalation:
Move to fresh air. Call a physician or poison control center immediately. Apply artificial respiration if victim is not breathing. If breathing is difficult, give oxygen.

Skin contact:
Immediately flush with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Call a physician or poison control center immediately. Wash contaminated clothing before reuse. Destroy or thoroughly clean contaminated shoes.

Eye contact:
Immediately flush with plenty of water for at least 15 minutes. If easy to do, remove contact lenses. Call a physician or poison control center immediately.

Ingestion:
Do NOT induce vomiting. Call a physician or poison control center immediately.

Notes to the physician:
Treatment: Symptoms may be delayed.

FIRE-FIGHTING MEASURES

Extinguishing media:
The product is non-combustible. Use fire-extinguishing media appropriate for surrounding materials.

Unsuitable extinguishing media:
None known.

Unusual Fire & Explosion Hazards:
Exposure to fire can generate toxic fumes. In fire or if heated, pressure increase may rupture container.

Special fire fighting procedures:
Move containers from fire area if you can do so without risk. Use water spray to keep fire-exposed containers cool. Cool containers exposed to flames with water until well after the fire is out.

Protective Measures:
Firefighters must use standard protective equipment including flame retardant coat, helmet with face shield, gloves, rubber boots, and in enclosed spaces, SCBA.

ACCIDENTAL RELEASE MEASURES

Personal precautions:
See Section 8 of the MSDS for Personal Protective Equipment. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Keep unauthorized personnel away. Keep upwind. Ventilate closed spaces before entering them.
Environmental precautions: Do not contaminate water sources or sewer. Prevent further leakage or spillage if safe to do so.

Spill Cleanup Methods: Absorb spill with vermiculite or other inert material, then place in a container for chemical waste. Dike far ahead of larger spill for later recovery and disposal.

Notification Procedures: Inform authorities if large amounts are involved.

7 HANDLING AND STORAGE

Handling: Wash hands thoroughly after handling. Do not get in eyes, on skin, on clothing. See Section 8 of the MSDS for Personal Protective Equipment. Do not breathe mist or vapor. Use only with adequate ventilation.

Storage: Keep container tightly closed. Store in a well-ventilated place. Do not store in metal containers.

8 EXPOSURE CONTROLS / PERSONAL PROTECTION

Exposure limits

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>Type</th>
<th>Exposure Limit values</th>
<th>Source</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA</td>
<td>TWA</td>
<td>25 ppm</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td></td>
<td>STEL</td>
<td>35 ppm</td>
<td>US. ACGIH Threshold Limit Values (2011)</td>
</tr>
<tr>
<td>AMMONIA</td>
<td>PEL</td>
<td>50 ppm 35 mg/m3</td>
<td>US. OSHA Table Z-1 Limits for Air Contaminants (29 CFR 1910.1000) (02 2006)</td>
</tr>
<tr>
<td></td>
<td>STEL</td>
<td>35 ppm 27 mg/m3</td>
<td>US. OSHA Table Z-1-A (29 CFR 1910.1000) (1989)</td>
</tr>
</tbody>
</table>

Protective Measures: Good general ventilation (typically 10 air changes per hour) should be used. Ventilation rates should be matched to conditions. If applicable, use process enclosures, local exhaust ventilation, or other engineering controls to maintain airborne levels below recommended exposure limits. If exposure limits have not been established, maintain airborne levels to an acceptable level. An eye wash and safety shower must be available in the immediate work area.

Respiratory Protection: In case of inadequate ventilation use suitable respirator.

Eye protection: Wear safety glasses with side shields (or goggles) and a face shield.

Skin and Body Protection: Wear suitable protective clothing and gloves.

Hygiene measures: Do not get in eyes. Observe good industrial hygiene practices. Wash contaminated clothing before reuse. Do not get this material in contact with skin. Wash hands before breaks and immediately after handling the product. Provide eyewash station and safety shower.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance
Physical State: Liquid
Form: Liquid
Color: Colorless
Odor: Odorless
Odor Threshold: No data available.
pH: 13.8
Freezing point: -74.4 °C
Boiling Point: 27.2 °C
Flash Point: Not applicable
Evaporation Rate: No data available.
Flammability (solid, gas): No data available.
Flammability Limit - Upper (%): No data available.
Flammability Limit - Lower (%): No data available.
Vapor pressure: No data available.
Vapor density (air=1): No data available.
Relative density: 0.9
Solubility(ies)
- Solubility in Water: Soluble
- Solubility (other): No data available.
Partition coefficient (n-octanol/water): No data available.
Autoignition Temperature: No data available.
Decomposition Temperature: No data available.
Viscosity: No data available.
Explosive properties: No data available.
Oxidizing properties: No data available.

10 STABILITY AND REACTIVITY

Stability: Material is stable under normal conditions.
Possibility of hazardous reactions: Hazardous polymerization does not occur.
Conditions to avoid: Excessive heat.
Hazardous decomposition products: Nitrogen Oxides

11 TOXICOLOGICAL INFORMATION

Product:
Acute Toxicity (Oral): LD 50 (Rat): 350 mg/kg

Inhalation: Severely irritating to respiratory system.
Ingestion: Harmful if swallowed.
Skin corrosion/irritation: Causes severe skin burns.
Serious eye damage/eye irritation: Causes serious eye damage.

Respiratory sensitizer/Skin sensitizer: Not a skin sensitizer.

Carcinogenicity: This substance has no evidence of carcinogenic properties.

Mutagenesis: No mutagenic components identified

Reproductive toxicity: No components toxic to reproduction

Other effects: None known.

12 ECOLOGICAL INFORMATION

General information: Not Applicable

Ecotoxicity: Expected to be very toxic to aquatic organisms.

Product:

Acute toxicity (Fish): LC 50 (Western mosquitofish (Gambusia affinis), 96 h): 15 mg/l

Chronic Toxicity (Fish): No data available.

Acute toxicity (Aquatic invertebrates): LC 50 (Water flea (Daphnia magna), 48 h): 0.66 mg/l

Chronic Toxicity (Aquatic invertebrates): No data available.

Acute toxicity (Aquatic plants): No data available.

Persistence and degradability: Expected to be readily biodegradable.

Bioaccumulative potential: No data available on bioaccumulation.

Mobility: The product is water soluble and may spread in water systems.

13 DISPOSAL CONSIDERATIONS

Disposal methods: Discharge, treatment, or disposal may be subject to national, state, or local laws.

Uncleaned Empty Packaging: Since emptied containers retain product residue, follow label warnings even after container is emptied.
14 TRANSPORT INFORMATION

DOT
UN number: UN 2672
Proper Shipping Name: Ammonia solutions
Transport hazard class(es): 8
Subsidiary risk label: –
Packing group: III
Label(s): 8
Marine Pollutant: Not Regulated

IMDG - International Maritime Dangerous Goods Code
UN number: UN 2672
UN proper shipping name: AMMONIA SOLUTION
Transport hazard class(es): 8
Subsidiary risk label: –
Packing group: III
Label(s): 8
Marine Pollutant: Not Regulated
EmS No.: F-A; S-B

IATA
UN number: UN 2672
Proper Shipping Name: Ammonia solution
Transport hazard class(es): 8
Subsidiary risk label: –
Packing group: III
Label(s): 8

15 REGULATORY INFORMATION

Inventory Status:
- Australia AICS: On or in compliance with the inventory
- Canada DSL Inventory List: On or in compliance with the inventory
- EU EINECS List: On or in compliance with the inventory
- EU ELINCS List: Not in compliance with the inventory
- Japan (ENCS) List: On or in compliance with the inventory
- EU No Longer Polymers List: Not in compliance with the inventory
- China Inv. Existing Chemical Substances: On or in compliance with the inventory
- Korea Existing Chemicals Inv. (KECI): On or in compliance with the inventory
- Canada NDSL Inventory: Not in compliance with the inventory
- Philippines PICCS: On or in compliance with the inventory
- US TSCA Inventory: On or in compliance with the inventory
- New Zealand Inventory of Chemicals: On or in compliance with the inventory
- Switzerland Consolidated Inventory: Not in compliance with the inventory
- Japan ISHL Listing: Not in compliance with the inventory
- Japan Pharmacopoeia Listing: Not in compliance with the inventory

US Regulations
- CERCLA Hazardous Substance List (40 CFR 302.4):
  AMMONIA Reportable quantity: 100 lbs.

- Clean Water Act Section 311 Hazardous Substances (40 CFR 117.3):
  AMMONIA Reportable quantity: 100 lbs.
● Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130):
  AMMONIA  Threshold quantity: 10000 lbs
  AMMONIA  Threshold quantity: 20000 lbs

SARA Title III
● Section 302 Extremely Hazardous Substance (40 CFR 355, Appendix A):

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>RQ</th>
<th>Threshold Planning Quantity</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA</td>
<td>100 lbs.</td>
<td>500 lbs.</td>
</tr>
</tbody>
</table>

● Section 311/312 (40 CFR 370):
  X Acute (Immediate)   □ Chronic (Delayed) □ Fire □ Reactive □ Pressure Generating

● Section 313 Toxic Release Inventory (40 CFR 372):

<table>
<thead>
<tr>
<th>Chemical name</th>
<th>CAS-No.</th>
<th>Reporting threshold for other users</th>
<th>Reporting threshold for manufacturing and processing</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIA</td>
<td>7664-41-7</td>
<td>10000 lbs</td>
<td>25000 lbs</td>
</tr>
</tbody>
</table>

State Regulations
● California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65):
  No ingredient regulated by CA Prop 65 present.

● Massachusetts Right-To-Know List:
  AMMONIA  Listed

● New Jersey Right-To-Know List:
  AMMONIA  Listed
  WATER    Listed
  AMMONIUM HYDROXIDE Listed

● Pennsylvania Right-To-Know List:
  AMMONIA  Listed
  WATER    Listed

16 OTHER INFORMATION

NFPA Hazard ID

Hazard rating: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe
COR: Corrosive

Revision Information:
Issue date: 10-18-2013
SDS No.:  
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