1. Product and Company Identification

Material name: Ammonium Hydroxide 29%

Version #: 02

Revision date: 02-11-2009

Product code: 405-039378, 405-041862, 405-063919, 405-063922, 405-063924, 405-063925, 405-063926, 405-063928, 405-063929, 405-064324, 405-064325, 405-135879, 405-138352

Product use: Industrial use

Manufacturer information: KMG Electronic Chemicals, Inc.
9555 W. Sam Houston Parkway South
Suite 600
Houston, Texas 77099 US
Phone Number: 713-600-3800
Emergency Phone No.: 1-866-706-3266

2. Hazards Identification

Emergency overview: DANGER

OSHA regulatory status: This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

Potential health effects:

Routes of exposure: Inhalation. Ingestion. Skin contact. Eye contact.

Eyes: This product causes eye burns. Risk of serious damage to eyes. Do not get this material in contact with eyes.

Skin: Causes skin burns. Do not get this material in contact with skin.

Inhalation: Causes burns. Do not breathe dust/fume/gas/mist/vapors/spray.

Ingestion: Ingestion may produce burns to the lips, oral cavity, upper airway, esophagus and possibly the digestive tract. Do not ingest.

Target organs: Eyes. Respiratory system. Skin.

Chronic effects: Prolonged skin contact may defat the skin and produce dermatitis.

Signs and symptoms: Symptoms can include irritation, redness, scratching of the cornea, and tearing.

Potential environmental effects: Components of this product are hazardous to aquatic life. May cause long-term adverse effects in the environment.

3. Composition / Information on Ingredients

<table>
<thead>
<tr>
<th>Components</th>
<th>CAS #</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous Ammonia</td>
<td>1336-21-6</td>
<td>29</td>
</tr>
</tbody>
</table>

4. First Aid Measures

First aid procedures:

Eye contact: Immediately flush eyes with plenty of water for at least 15 minutes. Hold eyelids apart. Remove contact lenses, if present and easy to do. Continue rinsing. Get medical attention immediately.

Skin contact: Get medical attention immediately. Remove and isolate contaminated clothing and shoes. For minor skin contact, avoid spreading material on unaffected skin. Wash clothing separately before reuse. Immediately flush skin at least 15 minutes with plenty of water.

Inhalation: If breathing is difficult, give oxygen. Immediately call a poison control center or doctor for treatment advise. Move person to fresh air. If breathing has ceased, start mouth-to-mouth artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Ingestion: Immediately call a poison control center or doctor for treatment advise. Have person sip a glass of water if able to swallow and if told so by a poison control center or doctor. Do not give anything by mouth to an unconscious person. Do not induce vomiting unless told to do so by a poison control center or doctor. If vomiting occurs naturally, have victim lean forward to reduce risk of aspiration.

Notes to physician: In case of shortness of breath, give oxygen. Keep victim warm.
5. Fire Fighting Measures

Flammable properties
The product is not flammable. Not a fire hazard.

Extinguishing media
Water. Dry chemical, foam, carbon dioxide.

Protection of firefighters
Use water spray to cool unopened containers. Cool containers with flooding quantities of water until well after fire is out. Prevent runoff from fire control or dilution from entering streams, sewers, or drinking water supply.

Specific methods
In the event of fire, cool tanks with water spray. Use water spray to cool unopened containers.

6. Accidental Release Measures

Personal precautions
Keep unnecessary personnel away. Local authorities should be advised if significant spillages cannot be contained. Stay upwind. Keep out of low areas. Keep people away from and upwind of spill/leak. Ventilate closed spaces before entering. Ensure adequate ventilation. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Use Personal Protection Equipment recommended in section 8 of the MSDS.

Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not contaminate water.

Methods for containment
Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Prevent entry into waterways, sewers, basements or confined areas.

Methods for cleaning up
Should not be released into the environment.

Large Spills: Dike far ahead of liquid spill for later disposal. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal.

Small Spills: Absorb spill with vermiculite or other inert material. Clean contaminated surface thoroughly. Avoid dust formation. After removal flush contaminated area thoroughly with water.

Never return spills in original containers for re-use.

7. Handling and Storage

Handling
Use Personal Protection Equipment recommended in section 8 of the MSDS. Handle and open container with care. Use only with adequate ventilation. Avoid prolonged exposure. Wash thoroughly after handling.

Storage
Keep in a well-ventilated place. Keep container tightly closed. Keep this material away from food, drink and animal feed. Keep out of the reach of children. Use care in handling/storage.

8. Exposure Controls / Personal Protection

Occupational exposure limits

<table>
<thead>
<tr>
<th>ACGIH Components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous Ammonia (1336-21-6)</td>
<td>STEL</td>
<td>35 ppm</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>25 ppm</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>U.S. - OSHA Components</th>
<th>Type</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aqueous Ammonia (1336-21-6)</td>
<td>STEL</td>
<td>35 mg/m3</td>
</tr>
<tr>
<td></td>
<td>TWA</td>
<td>27 mg/m3</td>
</tr>
</tbody>
</table>

Engineering controls
Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.
Personal protective equipment

Eye / face protection
Do not get this material in contact with eyes. Wear face shield if there is risk of splashes. Wear approved safety glasses or goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

Skin protection
Wear appropriate chemical resistant gloves. Wear appropriate chemical resistant clothing. Protective shoes or boots. Structural firefighters protective clothing provides limited protection in fire situations ONLY; it is not effective in spill situations. Use chemical splash goggles and face shield (ANSI Z87.1 or approved equivalent). Do not get this material in contact with skin. Do not get this material on clothing. Wear chemical protective equipment that is specifically recommended by the Personal Protection Equipment manufacturer.

Respiratory protection
Do not breathe dust/fume/gas/mist/vapors/spray. In case of inadequate ventilation or risk of inhalation of vapors, use suitable respiratory equipment.

General hygiene considerations
When using, do not eat, drink or smoke. Wash hands before breaks and immediately after handling the product. Remove and isolate contaminated clothing and shoes. Handle in accordance with good industrial hygiene and safety practice. Launder contaminated clothing before reuse.

9. Physical & Chemical Properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Colorless liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Colorless</td>
</tr>
<tr>
<td>Odor</td>
<td>Ammoniacal</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>Not available</td>
</tr>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Form</td>
<td>Liquid</td>
</tr>
<tr>
<td>pH</td>
<td>&gt; 14</td>
</tr>
<tr>
<td>Melting point</td>
<td>Not available</td>
</tr>
<tr>
<td>Freezing point</td>
<td>Not available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>84.2 °F (29 °C)</td>
</tr>
<tr>
<td>Flash point</td>
<td>Not available</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>Not available</td>
</tr>
<tr>
<td>Flammability</td>
<td>Not available</td>
</tr>
<tr>
<td>Flammability limits in air, upper, % by volume</td>
<td>Not available</td>
</tr>
<tr>
<td>Flammability limits in air, lower, % by volume</td>
<td>Not available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>0.67 bar</td>
</tr>
<tr>
<td>Vapor density</td>
<td>&gt; 1 Air = 1</td>
</tr>
<tr>
<td>Specific gravity</td>
<td>0.895 (water=1)</td>
</tr>
<tr>
<td>Relative density</td>
<td>0.895 g/cm3 (55.873 lb/ft3)</td>
</tr>
<tr>
<td>Solubility (water)</td>
<td>Completely soluble</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td>Not available</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>Not available</td>
</tr>
<tr>
<td>Decomposition temperature</td>
<td>Not available</td>
</tr>
</tbody>
</table>

10. Chemical Stability & Reactivity Information

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chemical stability</td>
<td>Stable at normal conditions.</td>
</tr>
<tr>
<td>Conditions to avoid</td>
<td>Heat. Heating can release hazardous gases.</td>
</tr>
<tr>
<td>Hazardous decomposition products</td>
<td>Nitrogen oxides (NOx).</td>
</tr>
<tr>
<td>Possibility of hazardous reactions</td>
<td>Hazardous polymerization does not occur.</td>
</tr>
</tbody>
</table>
11. Toxicological Information

Toxicological data

Components Test Results
Aqueous Ammonia (1336-21-6) Acute Oral LD50 Rat: 350 mg/kg

Sensitization Not available.
Acute effects Causes burns.
Local effects Causes burns.
Chronic effects Not available.
Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.
Epidemiology Not available.
Mutagenicity Not available.
Neurological effects Not available.
Reproductive effects Not available.
Teratogenicity Not available.

12. Ecological Information

Ecotoxicological data

Components Test Results
Aqueous Ammonia (1336-21-6) LC50 Western mosquitofish (Gambusia affinis): 15 mg/l 96 Hours

Ecotoxicity Components of this product are hazardous to aquatic life.
Environmental effects An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Persistence and degradability Not available.
Bioaccumulation / Accumulation Not available.
Mobility in environmental media Not available.

13. Disposal Considerations

Disposal instructions Dispose of this material and its container at hazardous or special waste collection point. Do not allow this material to drain into sewers/water supplies. Dispose in accordance with all applicable regulations.
Waste from residues / unused products Dispose of in accordance with local regulations.
Contaminated packaging Dispose of in accordance with local regulations.

14. Transport Information

DOT

Basic shipping requirements:
UN number 2672
Proper shipping name Ammonia solutions
Hazard class 8
Packing group III
Additional information:
Special provisions IB3, IP8, T7, TP1
Packaging exceptions 154
Packaging non bulk 203
Packaging bulk 241
ERG number 154
ERG code 154

IATA

Basic shipping requirements:
UN number 2672
Proper shipping name Ammonia solutions
Material name: Ammonium Hydroxide 29%

15. Regulatory Information

US federal regulations
This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: De minimis concentration
Aqueous Ammonia (CAS 1336-21-6) 1.0 %

US EPCRA (SARA Title III) Section 313 - Toxic Chemical: Listed substance
Aqueous Ammonia (CAS 1336-21-6) Listed.

CERCLA (Superfund) reportable quantity (lbs)
Aqueous Ammonia: 1000

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories
Immediate Hazard - Yes
Delayed Hazard - Yes
Fire Hazard - No
Pressure Hazard - No
Reactivity Hazard - Yes

Section 302 extremely hazardous substance
No

Section 311 hazardous chemical
Yes

Inventory status

<table>
<thead>
<tr>
<th>Country(s) or region</th>
<th>Inventory name</th>
<th>On inventory (yes/no)*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Australia</td>
<td>Australian Inventory of Chemical Substances (AICS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Domestic Substances List (DSL)</td>
<td>Yes</td>
</tr>
<tr>
<td>Canada</td>
<td>Non-Domestic Substances List (NDSL)</td>
<td>No</td>
</tr>
<tr>
<td>China</td>
<td>Inventory of Existing Chemical Substances in China (IECSC)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European Inventory of New and Existing Chemicals (EINECS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Europe</td>
<td>European List of Notified Chemical Substances (ELINCS)</td>
<td>No</td>
</tr>
<tr>
<td>Japan</td>
<td>Inventory of Existing and New Chemical Substances (ENCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>Korea</td>
<td>Existing Chemicals List (ECL)</td>
<td>Yes</td>
</tr>
<tr>
<td>New Zealand</td>
<td>New Zealand Inventory</td>
<td>Yes</td>
</tr>
<tr>
<td>Philippines</td>
<td>Philippine Inventory of Chemicals and Chemical Substances (PICCS)</td>
<td>Yes</td>
</tr>
<tr>
<td>United States &amp; Puerto Rico</td>
<td>Toxic Substances Control Act (TSCA) Inventory</td>
<td>Yes</td>
</tr>
</tbody>
</table>

*A “Yes” indicates that all components of this product comply with the inventory requirements administered by the governing country(s)

State regulations
This product does not contain a chemical known to the State of California to cause cancer, birth defects or other reproductive harm.
16. Other Information

Further information

HMIS® is a registered trade and service mark of the NPCA.

HMIS® ratings

Health: 4*
Flammability: 0
Physical hazard: 2

NFPA ratings

Health: 4
Flammability: 0
Instability: 0
Special hazards: W

Disclaimer

This information is provided without warranty. The information is believed to be correct. This information should be used to make an independent determination of the methods to safeguard workers and the environment.

Issue date

02-11-2009

This data sheet contains changes from the previous version in section(s):

First Aid Measures: Eye contact
First Aid Measures: Skin contact
First Aid Measures: Ingestion
First Aid Measures: General advice
Accidental Release Measures: Methods for cleaning up
Exposure Controls / Personal Protection: Eye / face protection
Physical & Chemical Properties: Odor
Ecological Information: Mobility in environmental media
Ecological Information: Environmental effects
Ecological Information: Persistence and degradability
Ecological Information: Bioaccumulation / Accumulation