Section 1 - Product and Company Information

Product Name                  CHROMIUM ETCHANT, STANDARD
Product Number                651826
Brand                         ALDRICH

Company                      Sigma-Aldrich
Address                      3050 Spruce Street
                              SAINT LOUIS MO 63103 US
Technical Phone:             800-325-5832
Fax:                         800-325-5052
Emergency Phone:             314-776-6555

Section 2 - Composition/Information on Ingredient

<table>
<thead>
<tr>
<th>Substance Name</th>
<th>CAS #</th>
<th>SARA 313</th>
</tr>
</thead>
<tbody>
<tr>
<td>ETCHANT, STANDARD</td>
<td>None</td>
<td>Yes</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Ingredient Name</th>
<th>CAS #</th>
<th>Percent</th>
<th>SARA 313</th>
</tr>
</thead>
<tbody>
<tr>
<td>AMMONIUM CERIUM(IV) NITRATE</td>
<td>16774-21-3</td>
<td>&gt;= 10</td>
<td>No</td>
</tr>
<tr>
<td></td>
<td></td>
<td>&lt;= 20</td>
<td></td>
</tr>
<tr>
<td>NITRIC ACID, 5%&lt;=C&lt;20%</td>
<td>7697-37-2</td>
<td>&gt;= 5</td>
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</tr>
<tr>
<td></td>
<td></td>
<td>&lt;= 6</td>
<td></td>
</tr>
</tbody>
</table>

Section 3 - Hazards Identification

EMERGENCY OVERVIEW
Oxidizing. Highly Toxic (USA) Toxic (EU).
Toxic if swallowed. Very toxic by inhalation. Causes burns.
Target organ(s): Lungs. Teeth.

HMIS RATING
HEALTH: 3*
FLAMMABILITY: 0
REACTIVITY: 3
SPECIAL HAZARD(S): Oxidizer

NFPA RATING
HEALTH: 3
FLAMMABILITY: 0
REACTIVITY: 3
SPECIAL HAZARD(S): Oxidizer

*additional chronic hazards present.

For additional information on toxicity, please refer to Section 11.

Section 4 - First Aid Measures

ORAL EXPOSURE
If swallowed, wash out mouth with water provided person is conscious. Call a physician.
INHALATION EXPOSURE
If inhaled, remove to fresh air. If breathing becomes difficult, call a physician.

DERMAL EXPOSURE
In case of skin contact, flush with copious amounts of water for at least 15 minutes. Remove contaminated clothing and shoes. Call a physician.

EYE EXPOSURE
In case of contact with eyes, flush with copious amounts of water for at least 15 minutes. Assure adequate flushing by separating the eyelids with fingers. Call a physician.

Section 5 - Fire Fighting Measures

FLASH POINT
N/A

AUTOIGNITION TEMP
N/A

FLAMMABILITY
N/A

EXTINGUISHING MEDIA
Suitable: Carbon dioxide, dry chemical powder, or appropriate foam.

FIREFIGHTING
Protective Equipment: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and eyes. Specific Hazard(s): Emits toxic fumes under fire conditions. Contact with other material may cause fire. May accelerate combustion.

Section 6 - Accidental Release Measures

PROCEDURE TO BE FOLLOWED IN CASE OF LEAK OR SPILL
Evacuate area.

PROCEDURE(S) OF PERSONAL PRECAUTION(S)
Wear self-contained breathing apparatus, rubber boots, and heavy rubber gloves.

METHODS FOR CLEANING UP
Absorb on sand or vermiculite and place in closed containers for disposal. Ventilate area and wash spill site after material pickup is complete.

Section 7 - Handling and Storage

HANDLING
User Exposure: Do not breathe vapor. Do not get in eyes, on skin, on clothing. Avoid prolonged or repeated exposure.

STORAGE
Suitable: Keep tightly closed. Keep away from combustible materials, heat, sparks, and open flame.

Section 8 - Exposure Controls / PPE
ENGINEERING CONTROLS
Use only in a chemical fume hood. Safety shower and eye bath.

PERSONAL PROTECTIVE EQUIPMENT
Respiratory: Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU). Where risk assessment shows air-purifying respirators are appropriate use a full-face respirator with multi-purpose combination (US) or type ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator.
Hand: Compatible chemical-resistant gloves.
Eye: Chemical safety goggles.

GENERAL HYGIENE MEASURES
Wash thoroughly after handling. Remove and wash contaminated clothing promptly.

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**Section 9 - Physical/Chemical Properties**

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
<th>At Temperature or Pressure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Physical State: Liquid</td>
<td></td>
</tr>
<tr>
<td>pH</td>
<td>N/A</td>
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</tr>
<tr>
<td>BP/BP Range</td>
<td>100 °C</td>
<td>760 mmHg</td>
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<tr>
<td>MP/MP Range</td>
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<td></td>
</tr>
<tr>
<td>Freezing Point</td>
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</tr>
<tr>
<td>Vapor Pressure</td>
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<tr>
<td>Vapor Density</td>
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<td></td>
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<tr>
<td>Saturated Vapor Conc.</td>
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<tr>
<td>SG/Density</td>
<td>1.16 g/cm³</td>
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<tr>
<td>Bulk Density</td>
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</tr>
<tr>
<td>Odor Threshold</td>
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</tr>
<tr>
<td>Volatile%</td>
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<td></td>
</tr>
<tr>
<td>VOC Content</td>
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<td></td>
</tr>
<tr>
<td>Water Content</td>
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<td></td>
</tr>
<tr>
<td>Solvent Content</td>
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<td></td>
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<tr>
<td>Evaporation Rate</td>
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<tr>
<td>Viscosity</td>
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<tr>
<td>Surface Tension</td>
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<tr>
<td>Partition Coefficient</td>
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<td></td>
</tr>
<tr>
<td>Decomposition Temp.</td>
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<tr>
<td>Flash Point</td>
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<td></td>
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<td>Explosion Limits</td>
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<tr>
<td>Flammability</td>
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<tr>
<td>Autoignition Temp</td>
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<tr>
<td>Refractive Index</td>
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<td>Optical Rotation</td>
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<td>Miscellaneous Data</td>
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</tr>
<tr>
<td>Solubility</td>
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<td></td>
</tr>
</tbody>
</table>

N/A = not available

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**Section 10 - Stability and Reactivity**

**STABILITY**
Stable: Stable.
Conditions to Avoid: Heat.
HAZARDOUS DECOMPOSITION PRODUCTS
Hazardous Decomposition Products: Nature of decomposition products not known.

HAZARDOUS POLYMERIZATION
Hazardous Polymerization: Will not occur

Section 11 - Toxicological Information

ROUTE OF EXPOSURE
Skin Contact: Causes burns.
Skin Absorption: May be harmful if absorbed through the skin.
Eye Contact: Causes burns.
Inhalation: Material is extremely destructive to the tissue of the mucous membranes and upper respiratory tract. May be harmful if inhaled.
Ingestion: May be harmful if swallowed.

TARGET ORGAN(S) OR SYSTEM(S)
Teeth. Lungs.

SIGNS AND SYMPTOMS OF EXPOSURE
To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated. Symptoms of exposure may include burning sensation, coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Inhalation may result in spasm, inflammation and edema of the larynx and bronchi, chemical pneumonitis, and pulmonary edema. Material is extremely destructive to tissue of the mucous membranes and upper respiratory tract, eyes, and skin.

Section 12 - Ecological Information

No data available.

Section 13 - Disposal Considerations

APPROPRIATE METHOD OF DISPOSAL OF SUBSTANCE OR PREPARATION
Contact a licensed professional waste disposal service to dispose of this material. Observe all federal, state, and local environmental regulations.

Section 14 - Transport Information

DOT
Proper Shipping Name: Corrosive liquids, oxidizing, n.o.s.
UN#: 3093
Class: 8
Packing Group: Packing Group II
Hazard Label: Corrosive
Hazard Label: Oxidizer
PIH: Not PIH

IATA
Proper Shipping Name: Corrosive liquid, oxidizing, n.o.s.
IATA UN Number: 3093
Hazard Class: 8
Packing Group: II

Section 15 - Regulatory Information
EU ADDITIONAL CLASSIFICATION
Symbol of Danger: O-C
R: 8-34
Risk Statements: Contact with combustible material may cause fire. Causes burns.
S: 17-26-36/37/39-45
Safety Statements: Keep away from combustible material. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

US CLASSIFICATION AND LABEL TEXT
Safety Statements: Keep away from combustible material. In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. Wear suitable protective clothing, gloves, and eye/face protection. In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
US Statements: Target organ(s): Lungs. Teeth.

UNITED STATES REGULATORY INFORMATION
SARA LISTED: Yes
NOTES: This product is or contains a component that is subject to SARA313 reporting requirements.

CANADA REGULATORY INFORMATION
WHMIS Classification: This product has been classified in accordance with the hazard criteria of the CPR, and the MSDS contains all the information required by the CPR.
DSL: Yes
NDSL: No

Section 16 - Other Information

DISCLAIMER
For R&D use only. Not for drug, household or other uses.

WARRANTY
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Inc., shall not be held liable for any damage resulting from handling or from contact with the above product. See reverse side of invoice or packing slip for additional terms and conditions of sale. Copyright 2010 Sigma-Aldrich Co. License granted to make unlimited paper copies for internal use only.