MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

TRANSENE COMPANY, INC.
DANVERS INDUSTRIAL PARK
10 ELECTRONICS AVENUE
DANVERS, MA 01923
TEL: 978. 777-7860 FAX: 978-739-5640
www.transene.com

MATERIAL NAME: NICKEL ETCHANT TFB
TRADE NAME: Nickel Etch TFB
CHEMICAL NAME: Nitric acid Aqueous solution

Reviewed: July 2006

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Ingredient</th>
<th>CAS Number</th>
<th>Toxicity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitric Acid</td>
<td>CAS# 7697-37-2</td>
<td>15-20% 2ppm (TLV)</td>
</tr>
<tr>
<td>Potassium Perfluoroalkyl Sulfonate</td>
<td>CAS# 2795-39-3</td>
<td>&lt;1% 0.1 mg/m³</td>
</tr>
<tr>
<td>Water</td>
<td>CAS# 7732-18-5</td>
<td>Balance</td>
</tr>
</tbody>
</table>

SECTION 3. HEALTH HAZARD IDENTIFICATION

Effects of overexposure: Oxides of nitrogen or nitric acid are highly irritant to the mucous membranes of the eyes, respiratory tract and the skin.
Eye Contact: Severe burning of eye tissue.
Skin Contact: Irritation and burning of the skin.
Inhalation: Causes burning and irritation of respiratory tract.
Ingestion: Ingestion of large quantities may be fatal. Severe burning of gastrointestinal tract.

SECTION 4. FIRST AID MEASURES:

Eye Contact: Irritant to naked eye; in case of contact flush eyes well for 15 minutes. Obtain medical attention.
Skin Contact: Irritant to exposed skin, flush skin well with water for 15 minutes, remove affected clothing, get medical attention.
Inhalation: If inhaled, remove to fresh air. If not breathing give artificial respiration. Seek medical attention.

SECTION 5: FIRE FIGHTING MEASURES

<table>
<thead>
<tr>
<th>Flash point and method</th>
<th>Autoignition Temp.</th>
<th>Flammability Limits in Air</th>
<th>Lower Upper</th>
</tr>
</thead>
<tbody>
<tr>
<td>Non-flammable</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Extinguishing media: Water spray or fog, carbon dioxide, and dry chemical.
Special fire fighting procedures: Water may cause frothing/wear chemically retardant gear and NIOSH approved self-contained breathing apparatus. Thermal decomposition produces toxic (NOx) fumes. Moderate hazard by chemical reaction with reducing agents/ wood and other organics may ignite spontaneously or have increased flammability.

SECTION 6: ACCIDENTAL RELEASE MEASURES
SPILLS, LEAKS: Cover the contaminated areas with soda ash and slaked lime mixture (50-50). Mix and add water if necessary to form slurry. Scoop up gross quantities. Place in DOT approved container.

SECTION 7. HANDLING AND STORAGE

Storage & Handling information
Store below 80 degrees Fahrenheit. Store in cool, dry place. Do not store near incompatible products or open flame. Store away from direct sunlight.

SECTION 8. EXPOSURE CONTROL/PERSOanal N PROTECTION

Respiratory protection: NIOSH approved organic vapor respirators where adequate ventilation is not present.
Ventilation: Where adequate ventilation is not available, use NIOSH approved vapor respirator with dust, fume and mist filters. Local ventilation through fume hoods or laminar flow stations is also preferred. Keep fumes away from strong bases or cyanide salts.
Protective gloves: Skin contact should be minimized through use of rubber gloves
Other protective equipment: Steel-tipped shoes, eye wash station, chemical safety shower, chemical retardant clothing.
Eye protection: Safety goggles, face shield

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling point at 1 atm, deg C&gt;200F</td>
<td></td>
</tr>
<tr>
<td>Specific, 20/4C</td>
<td>1.25</td>
</tr>
<tr>
<td>Vapor pressure at 15°C, mmHg&gt;1</td>
<td></td>
</tr>
<tr>
<td>Evap. Rate (BuAc=1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Vapor density (air=1)</td>
<td>N/A</td>
</tr>
<tr>
<td>Volatiles, %</td>
<td>N/A</td>
</tr>
<tr>
<td>Water solubility at 20 °C</td>
<td>complete</td>
</tr>
<tr>
<td>Molecular weight</td>
<td>N/A</td>
</tr>
</tbody>
</table>

Appearance and odor: Clear, colorless liquid with an acrid odor

SECTION 10: STABILITY AND REACTIVITY

Stability stable X conditions to avoid: excess heat, cyanide salts bases
Unstable
Incompatible with: Strong reducing agents, water, formic acid.
Hazardous decomposition products: Oxides of nitrogen

NFPA CODES

- Health - 3
- Flammability - 0
- Reactivity - 1

SECTION 11: TOXICOLOGICAL INFORMATION

No information found for product.

SECTION 12: ECOLOGICAL INFORMATION

No information found for product.

SECTION 13. DISPOSAL CONSIDERATIONS

DISPOSAL: Dispose of in accordance with all federal state and local regulations. Aqueous waste treatment if allowed. If not, contact professional disposal agency.

SECTION 14. TRANSPORTATION INFORMATION
DOT CLASS: CORROSIVE LIQUID, ACIDIC, INORGANIC, N.O.S.
(NITRIC ACID & FLUOROCARBON SURFACTANT
AQUEOUS SOLUTION) UN 3264

SECTION 15. REGULATORY INFORMATION

Health: 3
Reactivity: 2
Flammability: 0

SECTION 16. OTHER INFORMATION

Judgments as to the suitability of information herein for purchaser's purposes are necessarily purchaser's responsibility. Therefore, although reasonable care has been taken in the preparation of such information, Transene extends no warranties, makes no representations and assumes no responsibility as to accuracy or suitability of such information for application to purchaser's intended purpose of for consequences of its use.

ADDENDUM TO MATERIAL SAFETY DATA SHEET
REGULATORY STATUS

THIS ADDENDUM MUST NOT BE
DETACHED FROM THE MSDS
IDENTIFIES SARA 313 SUBSTANCE(S)

HAZARD CATEGORIES FOR
SARA
Section 311/312 Reporting

<table>
<thead>
<tr>
<th>Product or Components Of Products</th>
<th>SARA EHS Sect. 302 RQ (lbs.)</th>
<th>SARA Section 313 Chemicals Name List</th>
<th>CERCLA Sec. 103 RQ (lbs.)</th>
<th>RCRA Section 261.33</th>
</tr>
</thead>
<tbody>
<tr>
<td>NITRIC ACID, 70% (7697-37-2)</td>
<td>1000</td>
<td>Yes</td>
<td>No</td>
<td>No</td>
</tr>
</tbody>
</table>

SARA Section 302 EHS RQ: Reportable Quantity of Extremely Hazardous Substance, listed at 40 CFR 355.
SARA Section 302 EHS TPQ: Threshold Planning Quantity of Extremely Hazardous Substance. An asterisk (*) following a threshold Planning Quantity signifies that if the material is a solid and has a particle size equal to or larger than 100 micrometers, the Threshold Planning Quantity + 10,000 LBS.
SARA Section 313 Chemicals: Toxic Substances subject to annual release reporting requirements listed at 40 CFR 372.65.
CERCLA Sec 103: Comprehensive Environmental Response, Compensation and Liability Act (Superfund). Releases to air, land or water of these hazardous substances which exceed the Reportable Quantity (RQ) must be reported to the National Response Center (800-424-8802); Listed at 40 CFR 302.4
RCRA: Resource Conservation and Reclamation Act. Commercial chemical product wastes designated as acute hazards and toxic under 40 CFR 261.33

Effective Date 02-17-87 Supersedes 04-30-86

NITRIC ACID, 70%