MATERIAL SAFETY DATA SHEET
This MSDS is compatible with ISO 11014 – 1:1994 and conforms to ANSI standard 2400.1 – 2004.

SAFETY DATA SHEET
This SDS complies with REACH 1907/2006, 2001/98EC, and GHS

Section 1: Chemical Product and Company Identification

CHEMICAL SUPPLIER COMPANY NAME
Shin-Etsu MicroSi, Inc.
10028 South 51st Street
Phoenix, AZ 85044

EMERGENCY TELEPHONE
Chemtrec 24 hrs: (800) 424-9300
Information: (480) 893-8898
Fax: (480) 893-8637

DATE PREPARED: May 4, 2008

PRODUCT NAMES: MICROPRIMER P-20
FORMULA: Mixture
PRODUCT USE: This product is intended for use in Semiconductor photolithography processes.

DATE REVIEWED: May 23, 2010

Section 2: Hazards Identification

GHS Hazard Class
Signal word: Warning
Hazard Statement: Flammable Liquid -- Category 3
Precautionary Statements:
Prevention: Incompatible with acids, metallic oxides, amines and combustible materials. Keep away from ignition sources such as heat, sparks, and open flames – NO smoking.
Response: In case of fire, use Foam, dry chemical, or carbon dioxide.
Storage: Store upright in a cool, dry, well ventilated place.
Disposal: Waste from Residuals and Unused Products: Recommend waste material is disposed of by using incineration. Follow the waste disposal requirements of your country, state, or local authorities.

GHS Hazard Class
Signal word: Warning
Hazard Statement: Skin Irritation -- Category 2
Precautionary Statements:
Prevention: Wear protective gloves
Response: If on Skin wash with plenty of soap and water.
Storage: No Precautionary statement
Disposal: No Precautionary statement

HAZARD CLASSIFICATION: Flammable Liquid (based on IMO and DOT)
FIRE AND EXPLOSION: Flammable and Explosive Hazard

NPPA RATINGS:

<table>
<thead>
<tr>
<th>Component</th>
<th>Health (Blue)</th>
<th>Flammability (Red)</th>
<th>Reactivity (Yellow)</th>
<th>Special (White)</th>
</tr>
</thead>
<tbody>
<tr>
<td>HMDS</td>
<td>2</td>
<td>4</td>
<td>2</td>
<td>W</td>
</tr>
<tr>
<td>Propylene glycolmono-methyl ether acetate (PGMEA)</td>
<td>1</td>
<td>2</td>
<td>0</td>
<td>--</td>
</tr>
</tbody>
</table>

POTENTIAL HEALTH EFFECTS

INGESTION: May produce abdominal pain and nausea. Aspiration into lungs may produce severe lung damage and is a medical emergency. Other symptoms expected to parallel inhalation.

INHALATION: Causes irritation to the respiratory tract. Symptoms may include coughing and shortness of breath. Irritation effects normally prevent exposure high enough to cause systemic effect.

SKIN CONTACT: Causes severe irritation. Prolonged skin contact may cause dermatitis.

EYE CONTACT: Causes severe irritation. Vapors may cause eye irritation. Contact may cause corneal injury.

Section 3: Hazards Identification

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Section 4: First Aid Measures

INHALATION: Remove to fresh air. If not breathing, provide CPR (cardiopulmonary resuscitation). Get immediate medical attention.

SKIN CONTACT: Immediately flush skin with plenty of soap and water for at least 15 minutes. Remove contaminated clothing.

EYE CONTACT: Immediately flush eyes with plenty of water for at least 15 minutes. Get immediate medical attention.

INGESTION: If swallowed do not induce vomiting. Give large quantities of water to drink. Never give anything to an unconscious person. Get immediate medical attention.

Section 5: Fire-fighting Measures

FLASH POINT: 18°C, 64°F [Mixture]

FLAMMABLE LIMITS IN AIR (% by vol): Lower: 1.3%, Upper: 13.1%, [PGMEA]

EXTINGUISHING MEDIA: Foam, dry chemical, or carbon dioxide

SPECIAL FIREFIGHTING PROCEDURES:
Product is flammable due to solvent content. Wear supplied breathing air and other protective equipment. Work from the upwind side of the fire. Use suitable extinguishing agents. If possible, move the container to a safe area. If it cannot be removed from fire danger, protect it from destruction then cool container and vicinity by spraying with water. If ignited and it cannot be extinguished easily, evacuate the area and call your emergency responders.

UNUSUAL FIRE AND EXPLOSION HAZARDS:
Solvent vapors may create explosive mixtures with air. Vapors can travel a considerable distance to source of ignition and flash back. Prevent build-up and disperse of explosive atmospheres by using adequate ventilation. Under fire conditions, may emit corrosive Nitrogen Oxide vapors and other toxic fumes. [PGMEA] Ammonia will be generated from reaction with water [HMDS]

Section 6: Accidental Release Measures

ACTION TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:
Wear proper protective equipment as specified in the protective equipment section.
Warn other workers of spill.
In case of small spills, absorb with inert materials such as earth or dry sand. Place in a chemical waste container.
In case of large spills, dike the spill, if possible. Call emergency services. Absorb the chemical. Place in a chemical waste container.
Eliminate all sources of ignition and ventilate area.
Prevent spills or contaminated rinse water from entering sewers or watercourses.

DISPOSAL METHOD:
Disposal should be made in accordance with federal, state, and local regulations.
Incineration is recommended.

Section 7: Handling and Storage

PRECAUTIONS TO BE TAKEN IN HANDLING AND STORAGE:
Store upright in a cool, dry place, < 30°C (85°F)

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Keep container closed when not in use.
Prevent build-up of electro-static charges (e.g. by grounding).
Keep away from heat, sparks, flame, direct sunlight, and other possible sources of ignition.
Do not store with peroxides and oxidizing materials.
Use only with adequate ventilation.
Do not inhale vapors.
Avoid spilling and releasing vapor.
Wear proper protective equipment when handling this material.
Avoid contact with skin, eyes, or clothing.
Wash hands and face after handling this material.
Keep out of reach of children.
Follow all applicable local regulations for handling and storage.
Utilize chemical segregation.

INFORMATION ON EMPTYED CONTAINER
Dispose of this container according to local, state, and federal laws in your country.
Do not reuse this container. This container may be hazardous when emptied.
Residues will be explosive or flammable.
Do not puncture or cut this container.
Do not weld on or near this container.

SPECIFIC USES:
This product is intended for use in Semiconductor photolithography processes.

Section 8: Exposure Controls/Personal Protection

VENTILATION:
SPECIAL VENTILATION CONTROLS:
RESPIRATORY PROTECTION:
PROTECTIVE GLOVES:
EYE PROTECTION:
PROTECTIVE CLOTHING:
OTHER EQUIPMENT:
WORK/HYGIENE PRACTICES:

Always provide good general, mechanical room ventilation where this chemical is used.
Use this material inside totally enclosed equipment, or use it with local exhaust ventilation at points where vapors can be released into the workspace air.
Use NIOSH approved air-purifying respirator with Ammonia cartridge if ammonia fumes exceed TLV.
Wear chemical impervious gloves at all times while working with this product.
Recommended glove types include: Laminate Film, Nitrile, or Tri-polymer.
Check with your company’s glove supplier to ensure chemical resistance.
Safety Glasses, Chemical goggles, face shield
Wear suitable protective clothing to prevent skin contact. Use of anti-static type aprons is recommended.
Make safety shower, eyewash stations, and hand washing equipment available in the work area.
Avoid breathing vapor. Avoid contact with eyes. Wash hands and face after handling.

Section 9: Physical and Chemical Properties

APPEARANCE - COLOR:
PhysiCAL STATE:
ODOR:

<table>
<thead>
<tr>
<th>Propylene Glycol mono methyl ether acetate (PGMEA)</th>
<th>HMDS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling point</td>
<td>146 °C</td>
</tr>
<tr>
<td>Melting point</td>
<td>-80 °C</td>
</tr>
<tr>
<td>Vapor Pressure</td>
<td>5.07 kPa (@25°C)</td>
</tr>
<tr>
<td>Vapor Density (air=1)</td>
<td>4.6</td>
</tr>
<tr>
<td>Specific Gravity (@25°C)</td>
<td>1.03</td>
</tr>
<tr>
<td>Viscosity</td>
<td>2-15 mPa [Mixture]</td>
</tr>
<tr>
<td>----------</td>
<td>-------------------</td>
</tr>
<tr>
<td>% VOLATILE by VOLUME</td>
<td>More than 75% [Mixture]</td>
</tr>
<tr>
<td>EVAPORATION RATE (Butyl Acetate = 1):</td>
<td>&lt;1 [Mixture]</td>
</tr>
<tr>
<td>SOLUBILITY IN WATER:</td>
<td>18.5 wt.% at 20 ºC</td>
</tr>
</tbody>
</table>

PH: Not Available for product
FLASH POINT: 18 ºC, 64 ºF [Mixture] (tested by TAG closed-cup method)
FLAMMABILITY (Solid, gas): Not Available for product
EXPLOSIVE PROPERTIES: Not Available for product
OXIDIZING PROPERTIES: Not Available for product
SPECIFIC GRAVITY (@25 ºC): 0.95
EVAPORATION RATE: Not Available for product
% VOLATILE by VOLUME: More than 75%
PARTITION COEFFICIENT (Octanol/Water): Not Available for product
BOILING POINT: 134ºC
MELTING POINT: Not Available for product
VAPOR PRESSURE: 79mmHg
VAPOR DENSITY (AIR = 1): Not Available for product
SOLUBILITY IN WATER: Forms 2 layers
WATER SOLUBILITY IN THE SOLVENT: Not Available for product
FREEZING POINT: Not Available for product
VISCOSITY: Not Available for product

**Section 10: Stability and Reactivity**

STABILITY: Stable
INCOMPATIBILITY (MATERIALS TO AVOID): Oxidizing agents, strong acids, alkaline materials, water, and alcohol. May react quickly with alcohols and water under some conditions with release of moderate amounts of heat. [HMDS]
HAZARDOUS DECOMPOSITION PRODUCTS: Thermal decomposition products: Carbon Monoxide, Carbon dioxide, Fumes of aromatic and aliphatic hydrocarbons
HAZARDOUS POLYMERIZATION: Will not occur under normal temperatures and pressures.

**Section 11: Toxicological Information**

There is no toxicological information available for the product mixture.

<table>
<thead>
<tr>
<th>GHS Required Criteria</th>
<th>Toxicity Criteria</th>
<th>Toxicity Information</th>
<th>Comments</th>
<th>Chemical Constituent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Acute Toxicity</td>
<td>LD50 (Oral/Rat):</td>
<td>8532 mg/kg</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>LD50 (Abdominal Cavity/Mouse):</td>
<td>750 mg/kg</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>LD50 (Dermal/Rabbit):</td>
<td>&gt;5 g/kg</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>LD50 (Inhalation/Rat):</td>
<td>&gt;4350 ppm</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>LD50 (Oral/Rat):</td>
<td>850 mg/kg</td>
<td></td>
<td>HMDS</td>
</tr>
<tr>
<td></td>
<td>LC50 (Inhalation/Rat):</td>
<td>8700 mg/m3/4H</td>
<td></td>
<td>HMDS</td>
</tr>
<tr>
<td></td>
<td>LC50 (Inhalation/Mouse):</td>
<td>12 g/m2/2H</td>
<td></td>
<td>HMDS</td>
</tr>
<tr>
<td></td>
<td>LD50 (Oral/Rabbit):</td>
<td>1100 mg/kg</td>
<td></td>
<td>HMDS</td>
</tr>
<tr>
<td></td>
<td>LD50 (Skin Contact/Rabbit):</td>
<td>710 ul/kg</td>
<td></td>
<td>HMDS</td>
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<tr>
<td></td>
<td>TLC0 (Inhalation/Rat):</td>
<td>98 mg/m3/4H/17W-1</td>
<td></td>
<td>HMDS</td>
</tr>
<tr>
<td>Skin Corrosion/Irritation</td>
<td>RABBIT:</td>
<td>500 µL</td>
<td>Severe irritant</td>
<td>HMDS</td>
</tr>
<tr>
<td>Serious Eye Damage / Eye Irritation:</td>
<td>EYE-RABBIT:</td>
<td>No information is available</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>EYE-HUMAN:</td>
<td>No information is available</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td>Respiratory or Skin Sensitization:</td>
<td>SKIN-RABBIT:</td>
<td>No information is available</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>SKIN-HUMAN:</td>
<td>No information is available</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td>Germ Cell Mutagenicity:</td>
<td>IARC</td>
<td>Not listed</td>
<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>NTP</td>
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<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>OSHA</td>
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<td></td>
<td>PGMEA</td>
</tr>
<tr>
<td>Reproductive Toxicity:</td>
<td>No information is available</td>
<td></td>
<td></td>
<td>PGMEA</td>
</tr>
</tbody>
</table>

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Section 12: Ecological Information

<table>
<thead>
<tr>
<th>BIODEGRADATION</th>
<th>Biodegradation under aerobic static laboratory conditions is high (BOD20 OR BOD28/THOD IS GREATER THAN 40%) 10-day biological oxygen chemical demand is 1.04 P.P. 20-day biochemical oxygen demand is 1.12 P.P.</th>
<th>PGMEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOACCUMULATION</td>
<td>No information is available.</td>
<td>PGMEA</td>
</tr>
<tr>
<td>ECO TOXICITY</td>
<td>Acute LC50 for Fathead Minnow (Pimephales Promelas) is 161 mg/l</td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 for Water Flea (Daphnia Magna) is 408 mg/l to &gt;500 mg/l</td>
<td>PGMEA</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 for Rainbow trout (Oncorhynchus Mykiss) is 100-180 mg/l</td>
<td>PGMEA</td>
</tr>
<tr>
<td>MOBILITY</td>
<td>No information is available.</td>
<td></td>
</tr>
</tbody>
</table>

Section 13: Disposal Considerations

Recommend waste material be disposed of by using incineration. Follow the waste disposal requirements of your country, state, or local authorities.

CONTAMINATED PACKAGING: Contaminated packaging material should be disposed of by incineration as stated above for residues and unused product.

RINSATE: Do not dispose of rinse water containing product in a sanitary sewer system, stormwater drainage system, or wastewater treatment system. Rinsate should be disposed of by incineration as stated above for residues and unused product.

Section 14: Transport Information

ROAD TRANSPORT:  
ADR = International Carriage of Dangerous Goods by Road

DOT NUMBER:
DOT PROPER SHIPPING NAME

DOT / ADR HAZARD CLASS:
DOT / ADR LABELS:
PLACARD:
DOT / ADR PACKAGING GROUP:
HAZARD NUMBER – ADR:
ADR PROPER SHIPPING NAME:

EPA HAZARDOUS WASTE CLASS:

MARINE POLLUTANT:
DOT REPORTABLE QUANTITY (49 CFR 172.101, APP.) and CERCLA REPORTABLE QUANTITY (40 CFR PART 302, TABLE 302.4) HAZARDOUS SUBSTANCE(S) NAME / (CAS NO.), CONTENT(S) AND RQ: D001 (Ignitible = 100 lbs)

RAIL TRANSPORT:
RID CLASS No.:
RID PACKING GROUP:

FLAMMABLE, CORROSIVE

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SEA TRANSPORT: IMDG
PROPER SHIPPING NAME

UN NUMBER SEA
IMDG CLASS:
IMDG PACKING GROUP:
EmS No.:
MARINE POLLUTANT:
SEA TRANSPORT NOTES:

AIR TRANSPORT: IATA/ICAO
UN NUMBER:
PROPER SHIPPING NAME

HAZARD CLASS:
PACKAGING GROUP:

Section 15: Regulatory Information

LABEL FOR SUPPLY:

RISK PHRASES:
R: 10 Flammable
R: 36 Irritant to eyes.
S: 2 Keep out of the reach of children
S: 25 Avoid contact with eyes

TOXIC SUBSTANCES CONTROL ACT (TSCA) STATUS:
This product is in compliance with rules, regulations, and/or orders of TSCA.

SUPERFUND AMENDMENTS AND REAUTHORIZATION ACT OF 1986 (SARA) TITLE III SECTION 313
SUPPLIER NOTIFICATION:
This regulation requires submission of annual reports of toxic chemical(s) that appear in section 313 of the Emergency Planning and Community Right To Know Act of 1986 and 40 CFR 372. The toxic chemicals contained in this product are: None

CALIFORNIA PROPOSITION 65:
This regulation requires a warning for California Proposition 65 chemical(s) under the statute. The California proposition 65 chemical(s) contained in this product are: None

STATE RIGHT-TO-KNOW TOXIC SUBSTANCE OR HAZARDOUS SUBSTANCE LIST:
Florida Toxic Substance(s): None
Massachusetts's hazardous substance(s): None
Pennsylvania hazardous substance code(s): None
New Jersey: None
Illinois: None
Michigan: None

CANADA: This MSDS/SDS will be non compliant 3 years after the issue date.

WHMIS-INFORMATION:
PGMEA: B3 - Flammable and combustible material - Combustible liquid
The chemical components of this product are in compliance with the WHMIS regulations. This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

EUROPEAN UNION:

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Section 16: Other Information

Full Text:
European Community Hazards Identification:

R: 10 Flammable
R: 36 Irritant to eyes.
S: 2 Keep out of the reach of children
S: 25 Avoid contact with eyes

Danger Symbol(s): Xi Irritant
F Flammable

Revision Comments: Updated from May 4, 2008 to comply with GHS regulations.
Revision Number: 2
Information Sources: RTECS

FOR INDUSTRIAL USE ONLY

THIS MATERIAL SAFETY DATA SHEET IS OFFERED SOLELY FOR YOUR INFORMATION, CONSIDERATION, AND INVESTIGATION. THE DATA DESCRIBED IN THIS MSDS CONSIST OF DATA ON LITERATURE, OUR ACQUISITIONAL DATA, AND ANALOGICAL INFERENCE BY DATA OF SIMILAR CHEMICAL SUBSTANCES OR PRODUCTS. SHIN-ETSU CHEMICAL CO. LTD. PROVIDES NO WARRANTIES, EITHER EXPRESSED OR IMPLIED, AND ASSUMES NO RESPONSIBILITY FOR THE ACCURACY OR COMPLETENESS OF THE DATA CONTAINED HEREIN.

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