SECTION 1. PRODUCT AND COMPANY IDENTIFICATION

PRODUCT USE: Organic Polymer Solution
TRADE NAME: PMGI SF Series Resists
Positive Radiation Sensitive Resists
PRODUCT #: See Table 1 – Section 9
SUPPLIER: MicroChem Corporation
90 Oak Street, PO Box 426
Newton, MA 02464-0002
TELEPHONE: (617) 965-5511
FAX: (617) 965-5818
CHEMTREC USA
EMERGENCY #: (800) 424-9300
CHEMTREC INTL
EMERGENCY #: (703) 527-3887
MSDS DATE: 06 November 2008
REVISION DATE: 18 December 2008

SECTION 2. HAZARDS IDENTIFICATION

Hazardous Classification
Acute toxicity (oral) - Category 4
Acute toxicity (inhalation – gas/vapour) – Category 4
Flammable liquids - Category 3
Serious eye damage/eye irritation - Category 2A
Skin corrosion/irritation - Category 2
Target organ systemic toxicant single exp - Category 3
Toxic to reproduction – Category 2

Signal Word: WARNING!

Hazards
Flammable liquid and vapour.
Causes serious eye irritation.
Causes skin irritation.
Harmful if inhaled.
Harmful if swallowed.
May cause drowsiness and dizziness
May cause respiratory irritation.
Suspected of damaging fertility or the unborn child.

Precautions
Use only outdoors or in a well-ventilated area.
Avoid breathing mist or vapors.
Do not eat, drink or smoke when using this product.
Wash hands thoroughly after handling.
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat, sparks and open flame. - No smoking.
Use explosion-proof equipment.
Wear protective gloves and eye/face protection.
Take precautionary measures against static discharge.
If skin irritation occurs, get medical advice/attention.
In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.
IF INHALED: Remove to fresh air and keep at rest in a position comfortable for breathing.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
Take off contaminated clothing and wash before re-use.
IF exposed or concerned. Get medical attention/advice.
Rinse mouth.
Use extinguishing measures that are appropriate to local circumstances

SECTION 3. COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENTS:  Cyclopentanone (CAS: 120-92-3); 65-85%.
                Tetrahydrofurfuryl alcohol (CAS: 97-99-4); 10-15%
                Polyaliphatic imide copolymer (CAS: 102322-80-5); 1-25%
                Proprietary Surfactant, <1%

SECTION 4. FIRST AID MEASURES

INHALATION:  If respiratory irritation or distress occurs remove victim to fresh air and seek medical attention.
INGESTION:  Do not induce vomiting unless instructed to do so by a physician. Wash out mouth with water and keep at rest. Seek immediate medical attention.
SKIN CONTACT:  In case of contact, immediately wash with plenty of soap and water for at least 15 minutes. Seek medical attention. Remove contaminated clothing and shoes. Clean contaminated clothing and shoes before re-use.
EYE CONTACT:  Hold eyelids open and flush with a steady, gentle stream of water for at least 15 minutes. Seek medical attention.

SECTION 5. FIRE-FIGHTING MEASURES

EXTINGUISHING MEDIA:  Dry chemical, carbon dioxide, alcohol foam, and universal foam.
SPECIAL FIRE FIGHTING PRECAUTIONS:  Firefighters should wear NIOSH/MSHA approved self-contained breathing apparatus and full protective clothing. Remove all ignition sources if it can be done safely.
UNUSUAL FIRE OR EXPLOSION HAZARDS:  Product will burn under fire conditions. Containers may explode (due to build-up of pressure) when exposed to extreme
SAFETY DATA SHEET

CHEMICAL NAME: Organic Polymer Solution
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Positive Radiation Sensitive Resists
PRODUCT #: See Table 1 – Section 9

heat. Vapors may travel a considerable distance to a source of ignition and flash back along vapor trail.

SECTION 6. ACCIDENTAL RELEASE MEASURES

EVACUATION PROCEDURES & SAFETY: Wear appropriate protective gear for the situation. See Personal Protection information in Section 8.

CLEANUP & DISPOSAL OF SPILL: Absorb with an inert absorbent. Sweep up and place in an appropriate closed container (see Section 7). Clean up residual material by washing area with water. Collect washings for disposal.

ENVIRONMENTAL & REGULATORY REPORTING: Do not flush to drain. If required proper authorities should be notified.

SECTION 7. HANDLING AND STORAGE

PRECAUTIONS: Store container tightly closed in well-ventilated place.

STORAGE: Store in tightly closed container in a cool, dry, well-ventilated environment away from ignition sources. Recommended container materials are polyethylene or glass.

HANDLING: Use only under yellow light.
Keep away from heat, sparks, and flames.
Use only with mechanical exhaust.
Do not contact with skin, eyes, and clothing. Severe eye irritant.
Avoid prolonged or repeated contact with skin.
Do not breathe vapors or mist.
Wash with soap and water after handling.
Have safety shower and eye wash available.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION

OCCUPATIONAL EXPOSURE LIMITS: None Established.

RESPIRATORY PROTECTION: Under normal conditions, use of air-purifying (half-mask/full-face) respirator with cartridges/canisters approved for use against organic vapors, dust, mists and fumes is recommended.

VENTILATION: General area dilution/exhaust ventilation.

SKIN PROTECTION: Skin contact should be minimized through the use of gloves and suitable long-sleeved clothing.

EYE PROTECTION: Eye contact should be prevented through use of chemical safety glasses with side shields or splash proof goggles.
SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE: Clear, colorless to yellow liquid
ODOR: Slightly sweet
BOILING POINT:
- Cyclopentanone: 130 °C (266 °F)
- THFA: 178 °C (352 °F)

SPECIFIC GRAVITY:
See Table 1 below

VAPOR PRESSURE:
- Cyclopentanone: 8.7 mmHg @ 20 °C (68 °F)
- THFA: 0.2 mmHg @ 20 °C (68 °F)

VAPOR DENSITY:
- Cyclopentanone: 2.3 (air=1)
- THFA: 3.5 (air=1)

H₂O SOLUBILITY: Slightly soluble

% VOLATILES: See Table 1 below

FLASH POINT:
- Cyclopentanone: 26 °C (78 °F) TCC
- THFA: 74 °C (165 °F) TCC

AUTOIGNITION TEMP:
- Cyclopentanone: 550 °C (1022 °F)
- THFA: 282 °C (540 °F)

EXPLOSION LIMITS:
1.3 lower
unk. upper

Table 1

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<th>Product #</th>
<th>Specific Gravity</th>
<th>Volatiles (% by wt.)</th>
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SECTION 10. STABILITY AND REACTIVITY

STABILITY: Stable
INCOMPATIBILITY: Strong Oxidizing Agents, Strong Bases, Strong Acids, Strong Reducing Agents, Iron, Hydrazine
HAZARDOUS POLYMERIZATION: May occur. Avoid extreme pH.
HAZARDOUS COMBUSTION OR DECOMPOSITION PRODUCTS: Oxides of carbon.

SECTION 11. TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation, ingestion, eye and skin contact

Symptoms of Exposure: Causes severe eye irritation. Causes skin irritation. May cause upper respiratory tract irritation, central nervous system depression, shortness of breath, drowsiness and confusion. Prolonged, repeated exposure to high concentrations can cause adverse effects on male fertility

Acute Toxicity

Acute Oral Toxicity
Component: Cyclopentanone
LD50 rat 1180 mg/kg
Component: Tetrahydrofurfuryl Alcohol
LD50 rat 1600 mg/kg
Component: Polyaliphatic imide copolymer
LD50 rat >5000 mg/kg

Acute Dermal Toxicity
Component: Cyclopentanone
LD50 rabbit >5000 mg/kg
Component: Tetrahydrofurfuryl Alcohol
LD50 rat 5,000 mg/kg
Component: Polyaliphatic imide copolymer
LD50 rabbit >5000 mg/kg

Acute Inhalation Toxicity
Component: Cyclopentanone
LC50 rat 19,500 mg/l
Component: Tetrahydrofurfuryl Alcohol
No data found
Component: Polyaliphatic imide copolymer
No data found

Specific Concentration Limits
The values listed below represent the percentages of ingredients of unknown toxicity:
0% Acute oral toxicity
0% Acute dermal toxicity
25% Acute inhalation toxicity
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Skin corrosion/irritation
Component: Cyclopentanone
  Acute Skin Irritation: skin irritation, 500mg, rabbit. Mildly irritating
Component: Tetrahydrofurfuryl Alcohol
  Acute Skin Irritation: Moderate skin irritant
Component: Polyaliphatic imide copolymer
  Acute Skin Irritation: Not a skin irritant

Serious eye damage/eye irritation
Component: Cyclopentanone
  Acute Eye Irritation: eye irritation, 100mg, rabbit. Severely irritating.
Component: Tetrahydrofurfuryl Alcohol
  Acute Eye Irritation: Moderate eye irritant
Component: Polyaliphatic imide copolymer
  Acute Eye Irritation: slight eye irritant

Respiratory or Skin Sensitisation
Component: Cyclopentanone
  Skin sensitization – guinea pig – not a sensitizer
  Skin sensitization – human – not a sensitizer
Component: Tetrahydrofurfuryl Alcohol
  Skin sensitization - Guinea pig – not a sensitizer

Carcinogenicity
Component: Cyclopentanone
  Not considered carcinogenic by NTP, IARC, ACGIH or OSHA.
Component: Tetrahydrofurfuryl Alcohol
  Studies in laboratory animals indicate that this substance is not carcinogenic.

Germ Cell Mutagenicity
Component: Cyclopentanone
  Ames Test – negative
Component: Tetrahydrofurfuryl Alcohol
  No data found

Specific Target Organ Systemic Toxicity (single exposure)
Component: Cyclopentanone
  Central Nervous system
Component: Tetrahydrofurfuryl Alcohol
  Central Nervous System

Specific Target Organ Systemic Toxicity (repeated exposure)
Component: Cyclopentanone
  Central Nervous System
Component: Tetrahydrofurfuryl Alcohol
  Central Nervous System
Toxicity to Reproduction
Component: Cyclopentanone
   No adverse effects to reproduction or adverse developmental effects known.
Component: Tetrahydrofurfuryl Alcohol
   Laboratory animal studies have found adverse effects on male fertility.

Aspiration Hazards
No data found.

SECTION 12. ECOLOGICAL INFORMATION

Acute aquatic toxicity
   Acute toxicity to fish
      Component: Cyclopentanone
         48 hr LC50 Leuciscus idus melanotus: 2950 mg/L
      Component: Tetrahydrofurfuryl Alcohol
         No data found

   Acute toxicity to aquatic invertebrates
      Component: Cyclopentanone
         24 hr EC50 Daphnia magna: 1435 mg/L
      Component: Tetrahydrofurfuryl Alcohol
         No data found

   Acute toxicity to algae
      Component: Cyclopentanone
         72 hr EC50 Scenedesmus subspicatus >100 mg/l
      Component: Tetrahydrofurfuryl Alcohol
         No data found

Specific concentration limits
The values listed below represent the percentages of ingredients of unknown toxicity.
40% Acute aquatic toxicity – fish
40% Acute aquatic toxicity – aquatic invertebrates
40% Acute aquatic toxicity - algae

Chronic aquatic toxicity
   Chronic toxicity to fish
      No data found
   Chronic toxicity to aquatic invertebrates
      No data found
   Chronic toxicity to algae
      No data found

Persistence/Degradability
Component: Cyclopentanone
   Inherently biodegradable
Component: Tetrahydrofurfuryl Alcohol
   Readily biodegrades in soil, sludge and water. The atmospheric half-life is 13 hrs.

Bioaccumulation
   Component: Cyclopentanone
   Not expected to bioaccumulate
   Component: Tetrahydrofurfuryl Alcohol
   No data found

Mobility
   Component: Cyclopentanone
   No data found
   Component: Tetrahydrofurfuryl Alcohol
   No data found

SECTION 13. DISPOSAL CONSIDERATIONS

Precautions
CONTAINERS MAY BE HAZARDOUS WHEN EMPTY. Since emptied containers retain product residue follow all MSDS and label warnings even after container is emptied. Dispose of contents/container in accordance with local regulation.

Disposal
Comply with applicable local, state or international regulations regarding the proper disposal of this material and/or containers.

SECTION 14. TRANSPORTATION INFORMATION

HAZARD CLASSIFICATION: Flammable Liquid
SHIPPING NAME: Resin Solution
UN NUMBER: UN 1866
PACKING GROUP III

SECTION 15. REGULATORY INFORMATION

US AND INTERNATIONAL INFORMATION
Chemical Inventories:
   TSCA (US) – Components are listed or comply with TSCA regulations.
   EINECS/ELINCS/NLP (EU) – Components are listed or exempt.
   China – Components are listed or comply with inventory requirements.
   Japan – Components are listed or comply with inventory requirements.
   DSL/NDSL (Canada) – Components are listed.
   AICS (Australia) – Components are listed or comply with inventory requirements.
Korea - Components are listed or comply with inventory requirements.

SARA Title III: This product IS NOT subject to SARA Title III, Section 313 Reporting Requirements.

Calif. SCAQMD Rule 443.1 VOC's: See Table 1 – Section 9

SECTION 16. OTHER INFORMATION

National Fire Protection Association Hazard Ratings – NFPA:

2 Health Hazard Rating
3 Flammability Rating
0 Reactivity Rating

For additional information contact: productssafety@microchem.com

To the best of our knowledge, the above information is believed to be accurate but does not claim to be all-inclusive and is intended to be used only as a guide. The supplier makes no warranty of any kind, expressed or implied, concerning the use of this product and shall not be held liable for any damage resulting from handling or from contact with the above product. User assumes all risks incident to its use.

MSDS Revision Information: Revised GHS precaution phrases.