1 Identification of the substance/mixture and of the company

· Product identifier
  · Trade name: 950 PMMA Series Resists in Chlorobenzene
    Positive Radiation Sensitive Resists
  · Product number:
    950C1, 950C2, 950C3, 950C4, 950C4.5, 950C5, 950C6, 950C6.5, 950C7, 950C7.5, 950C8, 950C9, 950C10, 950C11, 950C12, 950C15
  · Application of the substance / the mixture Photoresist
  · Details of the supplier of the safety data sheet
    · Manufacturer/Supplier:
      MicroChem Corp.
      200 Flanders Road
      Westborough, MA 01581 USA
    · Information department:
      Product Safety
      Email: productsafety@microchem.com
    · Emergency telephone number:
      MicroChem Corp.: 617-965-5511
      Chemtrec USA Emergency: 800-424-9300
      Chemtrec International Emergency: 703-527-3887

2 Hazard(s) identification

· Classification of the substance or mixture
  · GHS02 Flame
    Flam. Liq. 3  H226 Flammable liquid and vapor.
  · GHS08 Health hazard
    STOT RE 1  H372 Causes damage to the kidneys, the liver, the spleen, the bone marrow and the thymus through prolonged or repeated exposure. Route of exposure: Oral, Inhalative.
  · GHS09 Environment
    Aquatic Chronic 2  H411 Toxic to aquatic life with long lasting effects.
  · GHS07
    Acute Tox. 4  H302 Harmful if swallowed.
    Acute Tox. 4  H332 Harmful if inhaled.
    STOT SE 3  H336 May cause drowsiness or dizziness.

· Label elements
  · GHS label elements The product is classified and labeled according to the Globally Harmonized System (GHS). (Contd. on page 2)
Safety Data Sheet
acc. to OSHA HCS

Printing date 02/05/2015  Reviewed on 02/05/2015

Trade name: 950 PMMA Series Resists in Chlorobenzene
Positive Radiation Sensitive Resists

· Hazard pictograms

GHS02  GHS07  GHS08  GHS09

· Signal word Danger

· Hazard-determining components of labeling:
chlorobenzene

· Hazard statements
H226 Flammable liquid and vapor.
H302+H332 Harmful if swallowed or if inhaled.
H336 May cause drowsiness or dizziness.
H372 Causes damage to the kidneys, the liver, the spleen, the bone marrow and the thymus through prolonged or repeated exposure. Route of exposure: Oral, Inhalative.
H411 Toxic to aquatic life with long lasting effects.

· Precautionary statements
P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P260 Do not breathe dust/fume/gas/mist/vapours/spray.
P280 Wear protective gloves/protective clothing/eye protection/face protection.
P233 Keep container tightly closed.
P273 Avoid release to the environment.
P301+P312 IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell.
P370+P378 In case of fire: Use for extinction: Alcohol resistant foam.
P370+P378 In case of fire: Use for extinction: Fire-extinguishing powder.
P370+P378 In case of fire: Use for extinction: Carbon dioxide.
P391 Collect spillage.
P403+P235 Store in a well-ventilated place. Keep cool.
P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

· Classification system:
· NFPA ratings (scale 0 - 4)

Health = 2
Fire = 3
Reactivity = 0

· HMIS-ratings (scale 0 - 4)

Health = 2
Fire = 3
Reactivity = 0

· Other hazards
· Results of PBT and vPvB assessment
· PBT: Not applicable.
· vPvB: Not applicable.

3 Composition/information on ingredients

· Chemical characterization: Mixtures
· Description: Mixture of the substances listed below with nonhazardous additions.

(Contd. of page 1)
Trade name: 950 PMMA Series Resists in Chlorobenzene
Positive Radiation Sensitive Resists

4 First-aid measures

· Description of first aid measures

· General information:
  Symptoms of poisoning may even occur after several hours; therefore medical observation for at least 48 hours after the accident.

· After inhalation:
  Supply fresh air.
  Seek medical treatment.
  Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist.
  Inhalation is not an expected route of exposure. If respiratory irritation or distress occurs remove victim to fresh air. Seek medical attention if respiratory irritation or distress continues.

· After skin contact: Generally the product does not irritate the skin.

· After eye contact: Rinse opened eye for several minutes under running water.

· After swallowing:
  Do not induce vomiting unless instructed to do so by a physician. Wash out mouth with water and keep person at rest. Seek immediate medical attention.

· Information for doctor:
  Most important symptoms and effects, both acute and delayed No further relevant information available.
  Indication of any immediate medical attention and special treatment needed
  No further relevant information available.

5 Fire-fighting measures

· Extinguishing media

· Suitable extinguishing agents:
  Alcohol resistant foam
  Fire-extinguishing powder
  Carbon dioxide
  CO2, sand, extinguishing powder. Do not use water.

· For safety reasons unsuitable extinguishing agents: Water with full jet

· Special hazards arising from the substance or mixture
  Containers may explode due to pressure increase when container is exposed to extreme heat. Vapors may travel a considerable distance to a source of ignition and flash back along vapor trail.
  In case of fire, the following can be released:
  Hydrogen chloride (HCl)
  Phosgene gas

· Advice for firefighters

· Protective equipment: Wear SCBA.
6 Accidental release measures

- Personal precautions, protective equipment and emergency procedures
  Ensure adequate ventilation
  Keep away from ignition sources
  Wear protective equipment. Keep unprotected persons away.
- Environmental precautions:
  Inform respective authorities in case of seepage into water course or sewage system.
  Do not allow to enter sewers/surface or ground water.
- Methods and material for containment and cleaning up:
  Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
  Dispose contaminated material as waste according to Section 13.
  Ensure adequate ventilation.
  Do not flush with water or aqueous cleansing agents
- Reference to other sections
  See Section 7 for information on safe handling.
  See Section 8 for information on personal protection equipment.
  See Section 13 for disposal information.

7 Handling and storage

- Handling:
  - Precautions for safe handling
    Store in cool, dry place in tightly closed containers.
    Ensure good ventilation/exhaust at the workplace.
    Prevent formation of aerosols.
  - Information about protection against explosions and fires:
    Use explosion-proof apparatus / fittings and spark-proof tools.
    Keep ignition sources away - Do not smoke.
    Protect against electrostatic charges.
- Conditions for safe storage, including any incompatibilities
- Storage:
  - Requirements to be met by storerooms and containers: No special requirements.
  - Information about storage in one common storage facility: Not required.
  - Further information about storage conditions:
    Store in a cool place. Heat will increase pressure and may lead to the receptacle bursting.
    Store under lock and key and with access restricted to technical experts or their assistants only.
    Protect from exposure to the light.
    Keep container tightly sealed.
- Specific end use(s) No further relevant information available.

8 Exposure controls/personal protection

- Additional information about design of technical systems: No further data; see item 7.
- Control parameters
  - Components with limit values that require monitoring at the workplace:
    108-90-7 chlorobenzene
    PEL 350 mg/m³, 75 ppm

(Contd. of page 3)
### Trade name: 950 PMMA Series Resists in Chlorobenzene
Positive Radiation Sensitive Resists

<table>
<thead>
<tr>
<th>TLV</th>
<th>46 mg/m³, 10 ppm</th>
</tr>
</thead>
</table>

- **Ingredients with biological limit values:**
  - **108-90-7 chlorobenzene**
    - BEI: 100 mg/g creatinine
    - Medium: urine
    - Time: end of shift at end of workweek
    - Parameter: 4-Chlorocatechol with hydrolysis (nonspecific)
    - 20 mg/g creatinine
    - Medium: urine
    - Time: end of shift at end of workweek
    - Parameter: p-Chlorophenol with hydrolysis (nonspecific)

- **Additional information:** The lists that were valid during the creation were used as basis.

- **Exposure controls**
  - **Personal protective equipment:**
    - **General protective and hygienic measures:**
      Keep away from food and beverages.
      Wash hands before breaks and at the end of work.
    - **Respiratory equipment:**
      In case of low exposure, use cartridge respirator. In case of intensive or longer exposure, use SCBA.
  - **Protection of hands:**
    The glove material has to be impermeable and resistant to the product/ the substance/ the preparation. Due to missing tests no recommendation to the glove material can be given for the product/ the preparation/ the chemical mixture.
    Contact glove manufacturer for break-through time.
  - **Material of gloves**
    - PVA gloves
    - Nitrile rubber, NBR
  - **Penetration time of glove material** Contact glove manufacturer for break-through time.
  - **Eye protection:**
    - Tightly sealed goggles

### 9 Physical and chemical properties

- **Information on basic physical and chemical properties**
  - **General Information**
    - **Appearance:**
      - Form: Fluid
      - Color: Clear to light yellow
    - **Odor:** Etheral
    - **Odor threshold:** Not determined.
    - **pH-value:** Not determined.
    - **Change in condition**
      - Melting point/Melting range: Undetermined.
## Trade name: 950 PMMA Series Resists in Chlorobenzene

Positive Radiation Sensitive Resists

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boiling point/Boiling range:</td>
<td>132 °C (270 °F)</td>
</tr>
<tr>
<td>· Flash point:</td>
<td>28 °C (82 °F)</td>
</tr>
<tr>
<td>· Flammability (solid, gaseous):</td>
<td>Not applicable.</td>
</tr>
<tr>
<td>· Ignition temperature:</td>
<td>590 °C (1094 °F)</td>
</tr>
<tr>
<td>· Decomposition temperature:</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Auto igniting:</td>
<td>Product is not selfigniting.</td>
</tr>
<tr>
<td>· Danger of explosion:</td>
<td>Product is not explosive. However, formation of explosive air/vapor mixtures are possible.</td>
</tr>
<tr>
<td>· Explosion limits:</td>
<td></td>
</tr>
<tr>
<td>Lower:</td>
<td>1.3 Vol %</td>
</tr>
<tr>
<td>Upper:</td>
<td>11.0 Vol %</td>
</tr>
<tr>
<td>· Vapor pressure at 20 °C (68 °F):</td>
<td>12 hPa (9 mm Hg)</td>
</tr>
<tr>
<td>· Density:</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Relative density</td>
<td>See Table 1 Other Information</td>
</tr>
<tr>
<td>· Vapour density</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Evaporation rate</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Solubility in / Miscibility with Water:</td>
<td>Water miscible No</td>
</tr>
<tr>
<td>· Partition coefficient (n-octanol/water):</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Viscosity:</td>
<td></td>
</tr>
<tr>
<td>Dynamic:</td>
<td>Not determined.</td>
</tr>
<tr>
<td>Kinematic:</td>
<td>Not determined.</td>
</tr>
<tr>
<td>· Solvent content:</td>
<td></td>
</tr>
<tr>
<td>Organic solvents:</td>
<td>0.0 %</td>
</tr>
<tr>
<td>· Solids content:</td>
<td>6.0 %</td>
</tr>
</tbody>
</table>

(Contd. on page 7)
Trade name: 950 PMMA Series Resists in Chlorobenzene
Positive Radiation Sensitive Resists

(Contd. of page 6)

<table>
<thead>
<tr>
<th>Name</th>
<th>Number</th>
<th>Sp.Grav.</th>
<th>Vol.(%by wt.)</th>
<th>VOC (g/L)</th>
</tr>
</thead>
<tbody>
<tr>
<td>950C1</td>
<td>M240001</td>
<td>1.106</td>
<td>99</td>
<td>1095</td>
</tr>
<tr>
<td>950C2</td>
<td>M240002</td>
<td>1.107</td>
<td>98</td>
<td>1085</td>
</tr>
<tr>
<td>950C3</td>
<td>M240003</td>
<td>1.108</td>
<td>97</td>
<td>1075</td>
</tr>
<tr>
<td>950C4</td>
<td>M240004</td>
<td>1.109</td>
<td>96</td>
<td>1065</td>
</tr>
<tr>
<td>950C4.5</td>
<td>M240504</td>
<td>1.109</td>
<td>95.5</td>
<td>1060</td>
</tr>
<tr>
<td>950C5</td>
<td>M240005</td>
<td>1.110</td>
<td>95</td>
<td>1055</td>
</tr>
<tr>
<td>950C6</td>
<td>M240006</td>
<td>1.111</td>
<td>94</td>
<td>1045</td>
</tr>
<tr>
<td>950C6.5</td>
<td>M240506</td>
<td>1.112</td>
<td>93.5</td>
<td>1040</td>
</tr>
<tr>
<td>950C7</td>
<td>M240007</td>
<td>1.113</td>
<td>93</td>
<td>1035</td>
</tr>
<tr>
<td>950C7.5</td>
<td>M240507</td>
<td>1.113</td>
<td>92.5</td>
<td>1030</td>
</tr>
<tr>
<td>950C8</td>
<td>M240008</td>
<td>1.114</td>
<td>92</td>
<td>1025</td>
</tr>
<tr>
<td>950C9</td>
<td>M240009</td>
<td>1.115</td>
<td>91</td>
<td>1015</td>
</tr>
<tr>
<td>950C10</td>
<td>M240010</td>
<td>1.115</td>
<td>90</td>
<td>1005</td>
</tr>
<tr>
<td>950C11</td>
<td>M240011</td>
<td>1.116</td>
<td>89</td>
<td>995</td>
</tr>
<tr>
<td>950C12</td>
<td>M240012</td>
<td>1.117</td>
<td>88</td>
<td>985</td>
</tr>
<tr>
<td>950C15</td>
<td>M240015</td>
<td>1.120</td>
<td>85</td>
<td>950</td>
</tr>
</tbody>
</table>

10 Stability and reactivity

- Reactivity
- Chemical stability: Stable under normal use conditions
- Thermal decomposition / conditions to be avoided: No decomposition if used according to specifications.
- Possibility of hazardous reactions: No dangerous reactions known.
- Conditions to avoid: Heat, flames and sparks. Extremes of temperature and direct sunlight.
- Incompatible materials: Strong Oxidizing Agents, Strong Acids, Aluminum, Potassium, Sodium, Magnesium
- Hazardous decomposition products:
  Carbon monoxide and carbon dioxide
  Hydrogen chloride (HCl)
  Possible traces of Phosgene

11 Toxicological information

- Information on toxicological effects
- Acute toxicity:
  - LD/LC50 values that are relevant for classification:

<table>
<thead>
<tr>
<th>108-90-7 chlorobenzene</th>
</tr>
</thead>
</table>

<table>
<thead>
<tr>
<th>Route</th>
<th>LD50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Oral</td>
<td>1110 mg/kg (Rat)</td>
</tr>
<tr>
<td>Dermal</td>
<td>&gt;7940 mg/kg (rabbit)</td>
</tr>
<tr>
<td>Inhalative</td>
<td>LC50 13.9 mg/L (Rat)</td>
</tr>
</tbody>
</table>

- Primary irritant effect:
  - on the skin: No irritant effect.
  - on the eye: No irritating effect.
  - Sensitization: No sensitizing effects known.
  - Experience with humans: No further relevant information available.
- Additional toxicological information:
  The product shows the following dangers according to internally approved calculation methods for preparations:
Trade name: 950 PMMA Series Resists in Chlorobenzene
Positive Radiation Sensitive Resists

12 Ecological information

· Toxicity

    · Aquatic toxicity:

    108-90-7 chlorobenzene

    | Parameter    | Concentration |
    |--------------|---------------|
    | EC50/24 h    | 4.30-16.00 mg/l (daphnia magna) |
    | EC50/96 h    | 12.5 mg/l (algae) |
    | LC100/48 h   | 0.05-28 mg/l (golden orfe) |
    | LC50/72 h    | 4.5-7.4 mg/l (Lepomis macrochirus (Bluegill)) |

    · Persistence and degradability: Expected to biodegrade

    · Behavior in environmental systems:

    · Bioaccumulative potential: Not expected to bioaccumulate.

    · Mobility in soil: No further relevant information available.

    · Ecotoxic effects:

    · Remark: Toxic for fish

    · Additional ecological information:

    · General notes:

    Water hazard class 2 (Self-assessment): hazardous for water
    Do not allow product to reach ground water, water course or sewage system.
    Danger to drinking water if even small quantities leak into the ground.
    Also poisonous for fish and plankton in water bodies.
    Toxic for aquatic organisms

    · Results of PBT and vPvB assessment

    · PBT: Not applicable.

    · vPvB: Not applicable.

    · Other adverse effects: No further relevant information available.

13 Disposal considerations

· Waste treatment methods

    · Recommendation:
    Must not be disposed of as regular garbage/trash. Do not allow product to reach sewage system.

    · Uncleaned packagings:

    · Recommendation: Disposal must be made in accordance with Federal, State, and Local regulations.
## 14 Transport information

<table>
<thead>
<tr>
<th>Details</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>UN-Number</strong></td>
<td>UN1866</td>
</tr>
<tr>
<td><strong>DOT, ADR, IMDG, IATA</strong></td>
<td>Resin solution</td>
</tr>
<tr>
<td><strong>DOT proper shipping name</strong></td>
<td>RESIN SOLUTION (CHLOROBENZENE), MARINE POLLUTANT</td>
</tr>
<tr>
<td><strong>IMDG</strong></td>
<td>RESIN SOLUTION</td>
</tr>
<tr>
<td><strong>IATA</strong></td>
<td>RESIN SOLUTION</td>
</tr>
</tbody>
</table>

### Transport hazard class(es)

- **DOT**
  - **Class**: 3 Flammable liquids.
  - **Label**: 3

- **ADR, IMDG, IATA**
  - **Class**: 3 Flammable liquids
  - **Label**: 3

### Packing group

- **DOT, ADR, IMDG, IATA**
  - **Packing group III**

### Environmental hazards:

- **Product contains environmentally hazardous substances:** chlorobenzene

- **Marine pollutant:** Yes

- **Special precautions for user**
  - **Warning:** Flammable liquids
  - **Danger code (Kemler):** 30
  - **EMS Number:** F-E-S-D

- **Segregation groups**
  - Liquid halogenated hydrocarbons

- **Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code**
  - Not applicable.

- **UN "Model Regulation":**
  - UN1866, Resin solution, 3, III

## 15 Regulatory information

- **Safety, health and environmental regulations/legislation specific for the substance or mixture**
  - **Sara**

- **Section 355 (extremely hazardous substances):**
  - None of the ingredients are listed.

- **Section 313 (Specific toxic chemical listings):**
  - 108-90-7 chlorobenzene

*(Contd. on page 10)*

*USA*
· **TSCA (Toxic Substances Control Act):**  
  One or more of the components of this formulation is (are) not in compliance with TSCA.  
  All ingredients are listed or comply with TSCA regulations.

· **Proposition 65**
  
  · **Chemicals known to cause cancer:**  
    None of the ingredients are listed.
  
  · **Chemicals known to cause reproductive toxicity for females:**  
    None of the ingredients are listed.
  
  · **Chemicals known to cause reproductive toxicity for males:**  
    None of the ingredients are listed.
  
  · **Chemicals known to cause developmental toxicity:**  
    None of the ingredients are listed.

· **Carcinogenic categories**
  
  · **EPA (Environmental Protection Agency)**  
    108-90-7 chlorobenzene  
    D
  
  · **TLV (Threshold Limit Value established by ACGIH)**  
    108-90-7 chlorobenzene  
    A3
  
  · **NIOSH-Ca (National Institute for Occupational Safety and Health)**  
    None of the ingredients are listed.
  
  · **OSHA-Ca (Occupational Safety & Health Administration)**  
    None of the ingredients are listed.
  
  · **Massachusetts State Right To Know List**  
    108-90-7 chlorobenzene
  
  · **New Jersey State Right To Know List**  
    108-90-7 chlorobenzene
  
  · **Pennsylvania Hazardous Substances List**  
    108-90-7 chlorobenzene

· **California SCAQMD Rule 443.1 VOC’s:** See Table 1 - Section 9

· **GHS label elements**  
  The product is classified and labeled according to the Globally Harmonized System (GHS).

· **Hazard pictograms**
  
  GHS02  GHS07  GHS08  GHS09

· **Signal word** Danger
  
  · **Hazard-determining components of labeling:**  
    chlorobenzene
  
  · **Hazard statements**
    H226 Flammable liquid and vapor.
    H302+H332 Harmful if swallowed or if inhaled.
    H336 May cause drowsiness or dizziness.
    H372 Causes damage to the kidneys, the liver, the spleen, the bone marrow and the thymus through prolonged or repeated exposure. Route of exposure: Oral, Inhalative.
Trade name: 950 PMMA Series Resists in Chlorobenzene
Positive Radiation Sensitive Resists

H411 Toxic to aquatic life with long lasting effects.

- Precautionary statements
  P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
  P260 Do not breathe dust/fume/gas/mist/vapours/spray.
  P280 Wear protective gloves/protective clothing/eye protection/face protection.
  P333 Keep container tightly closed.
  P273 Avoid release to the environment.
  P301+P312 If swallowed: Call a POISON CENTER or doctor/physician if you feel unwell.
  P370+P378 In case of fire: Use for extinction: Alcohol resistant foam.
  P370+P378 In case of fire: Use for extinction: Fire-extinguishing powder.
  P370+P378 In case of fire: Use for extinction: Carbon dioxide.
  P391 Collect spillage.
  P403+P235 Store in a well-ventilated place. Keep cool.
  P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

- Chemical safety assessment: A Chemical Safety Assessment has not been carried out.

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- Department issuing MSDS: Product safety department
- Contact: Mr. Cole

- Revision History:
The business address of the manufacturer in Section 1 was updated. The hazard classification and precautionary statements for the mixture in Section 2 were revised. The toxicology data in Sections 11 and 12 were revised.
- Date of preparation / last revision 02/05/2015 / 1
- Abbreviations and acronyms:
  RID: Règlement international concernant le transport des marchandises dangereuses par chemin de fer (Regulations Concerning the International Transport of Dangerous Goods by Rail)
  ICAO: International Civil Aviation Organization
  ADR: Accord européen sur le transport des marchandises dangereuses par Route (European Agreement concerning the International Carriage of Dangerous Goods by Road)
  IMDG: International Maritime Code for Dangerous Goods
  DOT: US Department of Transportation
  IATA: International Air Transport Association
  ACGIH: American Conference of Governmental Industrial Hygienists
  EINECS: European Inventory of Existing Commercial Chemical Substances
  ELINCS: European List of Notified Chemical Substances
  CAS: Chemical Abstracts Service (division of the American Chemical Society)
  NFPA: National Fire Protection Association (USA)
  HMIS: Hazardous Materials Identification System (USA)
  LC50: Lethal concentration, 50 percent
  LD50: Lethal dose, 50 percent