SAFETY DATA SHEET
ROHM AND HAAS ELECTRONIC MATERIALS LLC

Product name: MICROPOSIT™ MF™ -321 DEVELOPER

ROHM AND HAAS ELECTRONIC MATERIALS LLC encourages and expects you to read and understand the entire (M)SDS, as there is important information throughout the document. We expect you to follow the precautions identified in this document unless your use conditions would necessitate other appropriate methods or actions.

1. IDENTIFICATION

Product name: MICROPOSIT™ MF™ -321 DEVELOPER

Recommended use of the chemical and restrictions on use
Identified uses: Chemical Specialty

COMPANY IDENTIFICATION
ROHM AND HAAS ELECTRONIC MATERIALS LLC
A Subsidiary of The Dow Chemical Company
455 FOREST STREET
MARLBOROUGH MA 01752
UNITED STATES

Customer Information Number: 215-592-3000
SDSQuestion@dow.com

EMERGENCY TELEPHONE NUMBER
24-Hour Emergency Contact: 1 800 424 9300
Local Emergency Contact: 800-424-9300

2. HAZARDS IDENTIFICATION

Hazard classification
This material is hazardous under the criteria of the Federal OSHA Hazard Communication Standard 29CFR 1910.1200.
Skin irritation - Category 2
Eye irritation - Category 2A
Specific target organ toxicity - single exposure - Category 1 - Oral
Specific target organ toxicity - repeated exposure - Category 1 - Dermal

Label elements
Hazard pictograms
Signal word: **DANGER!**

**Hazards**
Causes skin irritation.
Causes serious eye irritation.
Causes damage to organs (Central nervous system) if swallowed.
Causes damage to organs (Liver, thymus gland) through prolonged or repeated exposure in contact with skin.

**Precautionary statements**

**Prevention**
Do not breathe dust/ fume/ gas/ mist/ vapours/ spray.
Wash skin thoroughly after handling.
Do not eat, drink or smoke when using this product.
Wear eye protection/ face protection.
Wear protective gloves.

**Response**
IF ON SKIN: Wash with plenty of soap and water.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF exposed: Call a POISON CENTER or doctor/ physician.
If skin irritation occurs: Get medical advice/ attention.
If eye irritation persists: Get medical advice/ attention.
Take off contaminated clothing and wash before reuse.

**Storage**
Store locked up.

**Disposal**
Dispose of contents/ container to an approved waste disposal plant.

**Other hazards**
no data available

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### 3. COMPOSITION/INFORMATION ON INGREDIENTS

**Chemical nature:** Solution of organic compounds
This product is a mixture.

<table>
<thead>
<tr>
<th>Component</th>
<th>CASRN</th>
<th>Concentration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Water</td>
<td>7732-18-5</td>
<td>&gt; 95.0 %</td>
</tr>
</tbody>
</table>
4. FIRST AID MEASURES

**Description of first aid measures**

**Inhalation:** Remove from exposure. If there is difficulty in breathing, give oxygen. Seek medical attention if symptoms persist.

**Skin contact:** Wash skin with water. Continue washing for at least 15 minutes. Obtain medical attention if blistering occurs or redness persists.

**Eye contact:** Immediately flush the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.

**Ingestion:** Wash out mouth with water. Have victim drink 1-3 glasses of water to dilute stomach contents. Immediate medical attention is required. Never administer anything by mouth if a victim is losing consciousness, is unconscious or is convulsing.

**Most important symptoms and effects, both acute and delayed:** Aside from the information found under Description of first aid measures (above) and Indication of immediate medical attention and special treatment needed (below), any additional important symptoms and effects are described in Section 11: Toxicology Information.

**Indication of any immediate medical attention and special treatment needed**

**Notes to physician:** Treat symptomatically.

5. FIREFIGHTING MEASURES

**Suitable extinguishing media:** Not readily combustible. Select extinguishing agent appropriate to other materials involved.

**Unsuitable extinguishing media:** no data available

**Special hazards arising from the substance or mixture**

**Hazardous combustion products:** no data available

**Unusual Fire and Explosion Hazards:** No specific measures necessary.

**Advice for firefighters**

**Fire Fighting Procedures:** Keep people away. Isolate fire and deny unnecessary entry.

**Special protective equipment for firefighters:** Wear full protective clothing and self-contained breathing apparatus.
6. ACCIDENTAL RELEASE MEASURES

Personal precautions, protective equipment and emergency procedures: Wear suitable protective clothing.

Environmental precautions: Prevent the material from entering drains or water courses. Do not discharge directly to a water source. Advise Authorities if spillage has entered watercourse or sewer or has contaminated soil or vegetation.

Methods and materials for containment and cleaning up: Cover with absorbent or contain. Collect and dispose.

7. HANDLING AND STORAGE

Precautions for safe handling: Use only in well-ventilated areas. Avoid breathing vapor. Avoid contact with eyes, skin and clothing. Keep container tightly closed.

Conditions for safe storage: Store in original container. Storage area should be: cool dry well ventilated out of direct sunlight away from incompatible materials No special precautions necessary.

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Control parameters
Exposure limits are listed below, if they exist.

Exposure controls
Engineering controls: Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (local exhaust), and control of process conditions.

Individual protection measures
Eye/face protection: Goggles
Skin protection
   Hand protection: Butyl rubber gloves. Other chemical resistant gloves may be recommended by your safety professional.
   Other protection: Normal work wear.
Respiratory protection: Respiratory protection if there is a risk of exposure to high vapor concentrations. The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance
   Physical state liquid
   Color colourless
   Odor Amines.
   Odor Threshold no data available
<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>pH</strong></td>
<td>12</td>
</tr>
<tr>
<td><strong>Melting point/range</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Freezing point</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Boiling point (760 mmHg)</strong></td>
<td>&gt; 100 °C ( &gt; 212 °F)</td>
</tr>
<tr>
<td><strong>Flash point</strong></td>
<td>Not applicable</td>
</tr>
<tr>
<td><strong>Evaporation Rate (Butyl Acetate = 1)</strong></td>
<td>Slower than ether</td>
</tr>
<tr>
<td><strong>Flammability (solid, gas)</strong></td>
<td>Not Applicable</td>
</tr>
<tr>
<td><strong>Lower explosion limit</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Upper explosion limit</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Vapor Pressure</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Relative Vapor Density (air = 1)</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Relative Density (water = 1)</strong></td>
<td>1.05</td>
</tr>
<tr>
<td><strong>Water solubility</strong></td>
<td>completely soluble</td>
</tr>
<tr>
<td><strong>Partition coefficient: n-octanol/water</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Auto-ignition temperature</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Decomposition temperature</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Kinematic Viscosity</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Explosive properties</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Oxidizing properties</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Molecular weight</strong></td>
<td>no data available</td>
</tr>
<tr>
<td><strong>Volatile Organic Compounds</strong></td>
<td>Not applicable</td>
</tr>
</tbody>
</table>

NOTE: The physical data presented above are typical values and should not be construed as a specification.

### 10. STABILITY AND REACTIVITY

**Reactivity:** no data available

**Chemical stability:** Stable under normal conditions.

**Possibility of hazardous reactions:** No dangerous reaction known under conditions of normal use. Product will not undergo hazardous polymerization.

**Conditions to avoid:** contact with incompatible materials

**Incompatible materials:** Acids. Oxidizers

**Hazardous decomposition products:** None known.
11. TOXICOLOGICAL INFORMATION

Toxicological information on this product or its components appear in this section when such data is available.

Acute toxicity
   Acute oral toxicity
   Product test data not available.
   
   Acute dermal toxicity
   Product test data not available.
   
   Acute inhalation toxicity
   Product test data not available.

Skin corrosion/irritation
   Product test data not available.

Serious eye damage/eye irritation
   Product test data not available.

Sensitization
   Product test data not available.

Specific Target Organ Systemic Toxicity (Single Exposure)
   Product test data not available.

Specific Target Organ Systemic Toxicity (Repeated Exposure)
   Product test data not available.

Carcinogenicity
   Not considered carcinogenic by NTP, IARC, and OSHA

Teratogenicity
   Product test data not available.

Reproductive toxicity
   Product test data not available.

Mutagenicity
   Product test data not available.

Aspiration Hazard
   Product test data not available.

COMPONENTS INFLUENCING TOXICOLOGY:

Polyalkylene glycol
   Acute oral toxicity
Single dose oral LD50 has not been determined.

**Acute dermal toxicity**
The dermal LD50 has not been determined.

**Acute inhalation toxicity**
The LC50 has not been determined.

**Skin corrosion/irritation**
No relevant data found.

**Serious eye damage/eye irritation**
No relevant data found.

**Sensitization**
For skin sensitization:
No relevant data found.

For respiratory sensitization:
No relevant data found.

**Specific Target Organ Systemic Toxicity (Single Exposure)**
Available data are inadequate to determine single exposure specific target organ toxicity.

**Specific Target Organ Systemic Toxicity (Repeated Exposure)**
No relevant data found.

**Teratogenicity**
No relevant data found.

**Reproductive toxicity**
No relevant data found.

**Mutagenicity**
No relevant data found.

**Aspiration Hazard**
No aspiration toxicity classification

**Tetramethylammonium hydroxide**

**Acute oral toxicity**
LD50, Rat, female, 7.5 - 50 mg/kg

**Acute dermal toxicity**
LD50, Rat, male and female, 25 - 50 mg/kg

**Acute inhalation toxicity**
The LC50 has not been determined.

**Skin corrosion/irritation**
Brief contact may cause skin burns. Symptoms may include pain, severe local redness and tissue damage.

**Serious eye damage/eye irritation**
May cause severe eye irritation.

**Sensitization**
For skin sensitization:
No relevant data found.

For respiratory sensitization:
No relevant data found.

**Specific Target Organ Systemic Toxicity (Single Exposure)**
Causes damage to organs.
Route of Exposure: Oral
Target Organs: Central nervous system

**Specific Target Organ Systemic Toxicity (Repeated Exposure)**
In animals, effects have been reported on the following organs:
Central nervous system.
Liver.
Thymus.

**Teratogenicity**
Did not cause birth defects or any other fetal effects in laboratory animals.

**Reproductive toxicity**
In animal studies, did not interfere with reproduction.

**Aspiration Hazard**
No aspiration toxicity classification

**Carcinogenicity**
Not considered carcinogenic by NTP, IARC, and OSHA

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**12. ECOLOGICAL INFORMATION**

*Ecotoxicological information on this product or its components appear in this section when such data is available.*

**Toxicity**

**Polyalkylene glycol**

*Acute toxicity to fish*
No relevant data found.

**Tetramethylammonium hydroxide**

*Acute toxicity to fish*
LC50, Pimephales promelas (fathead minnow), flow-through, 96 Hour, 426 mg/l

*Acute toxicity to aquatic invertebrates*
EC50, Daphnia magna, 48 Hour, 3 mg/l

*Acute toxicity to algae/aquatic plants*
EC50, Pseudokirchleriella subcapita, 72 Hour, Growth rate, 96.3 mg/l
NOEC, Pseudokirchleriella subcapita, 72 Hour, Growth rate, 6.25 mg/l

**Toxicity to bacteria**
EC50, activated sludge, 3 Hour, Respiration rates, > 1,000 mg/l

**Chronic toxicity to aquatic invertebrates**
LC50, Daphnia magna, 11 d, mortality, 0.130 mg/l
NOEC, Daphnia magna, 11 d, mortality, 0.030 mg/l

**Persistence and degradability**

**Polyalkylene glycol**
**Biodegradability:** No relevant data found.

**Tetramethylammonium hydroxide**
**Biodegradability:** Based on stringent OECD test guidelines, this material cannot be considered as readily biodegradable; however, these results do not necessarily mean that the material is not biodegradable under environmental conditions.
**Biodegradation:** > 60 %
**Exposure time:** 28 d
**Method:** OECD Test Guideline 301B or Equivalent

**Bioaccumulative potential**

**Polyalkylene glycol**
**Bioaccumulation:** No bioconcentration is expected because of the relatively high water solubility.

**Tetramethylammonium hydroxide**
**Partition coefficient: n-octanol/water (log Pow):** -2.47 estimated **Partition coefficient: n-octanol/water (log Pow):** < -1.4

**Mobility in soil**

**Polyalkylene glycol**
No relevant data found.

**Tetramethylammonium hydroxide**
No relevant data found.

### 13. DISPOSAL CONSIDERATIONS

**Disposal methods:** Dispose in accordance with all local, state (provincial), and federal regulations. Under RCRA, it is the responsibility of the product’s user to determine at the time of disposal, whether the product meets RCRA criteria for hazardous waste. This is because the product uses, transformations, mixtures, processes, etc. may render the resulting materials hazardous.

**Treatment and disposal methods of used packaging:** Empty containers retain product residues. Follow label warnings even after container is emptied. Improper disposal or reuse of this container may be dangerous and illegal. Refer to applicable federal, state and local regulations.
14. TRANSPORT INFORMATION

DOT

Proper shipping name: Tetramethylammonium hydroxide solution
UN number: UN 1835
Class: 8
Packing group: III

Classification for SEA transport (IMO-IMDG):

Proper shipping name: TETRAMETHYLAMMONIUM HYDROXIDE SOLUTION
UN number: UN 1835
Class: 8
Packing group: III
Marine pollutant: No
Transport in bulk: Consult IMO regulations before transporting ocean bulk
according to Annex I or II of MARPOL 73/78 and the IBC or IGC Code

Classification for AIR transport (IATA/ICAO):

Proper shipping name: Tetramethylammonium hydroxide, solution
UN number: UN 1835
Class: 8
Packing group: III

This information is not intended to convey all specific regulatory or operational requirements/information relating to this product. Transportation classifications may vary by container volume and may be influenced by regional or country variations in regulations. Additional transportation system information can be obtained through an authorized sales or customer service representative. It is the responsibility of the transporting organization to follow all applicable laws, regulations and rules relating to the transportation of the material.

15. REGULATORY INFORMATION

OSHA Hazard Communication Standard
This product is considered hazardous under the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Sections 311 and 312
Immediate health hazard

Superfund Amendments and Reauthorization Act of 1986 Title III (Emergency Planning and Community Right-to-Know Act of 1986) Section 313
This product does not contain a chemical which is listed in Section 313 at or above de minimis concentrations.
California (Proposition 65)
This product does not contain materials which the State of California has found to cause cancer, birth defects or other reproductive harm.

United States TSCA Inventory (TSCA)
All components of this product are in compliance with the inventory listing requirements of the U.S. Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

16. OTHER INFORMATION

Hazard Rating System

<table>
<thead>
<tr>
<th>NFPA</th>
<th>Health</th>
<th>Fire</th>
<th>Reactivity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>3</td>
<td>0</td>
<td>0</td>
</tr>
</tbody>
</table>

Revision
Identification Number: 101300830 / 1304 / Issue Date: 04/06/2015 / Version: 1.0
Most recent revision(s) are noted by the bold, double bars in left-hand margin throughout this document.

Information Source and References
This SDS is prepared by Product Regulatory Services and Hazard Communications Groups from information supplied by internal references within our company.

ROHM AND HAAS ELECTRONIC MATERIALS LLC urges each customer or recipient of this (M)SDS to study it carefully and consult appropriate expertise, as necessary or appropriate, to become aware of and understand the data contained in this (M)SDS and any hazards associated with the product. The information herein is provided in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ between various locations. It is the buyer’s/user’s responsibility to ensure that his activities comply with all federal, state, provincial or local laws. The information presented here pertains only to the product as shipped. Since conditions for use of the product are not under the control of the manufacturer, it is the buyer’s/user’s duty to determine the conditions necessary for the safe use of this product. Due to the proliferation of sources for information such as manufacturer-specific (M)SDSs, we are not and cannot be responsible for (M)SDSs obtained from any source other than ourselves. If you have obtained an (M)SDS from another source or if you are not sure that the (M)SDS you have is current, please contact us for the most current version.