Electroless Copper Plating Solution

Section 1: Identification

1.1 Identification
Product Name: Electroless Copper Plating Solution

1.2 Relevant identified uses of the substance or mixture and uses advised against
Use of the substance/mixture: Electroless Copper Plating

1.3 Details of the supplier of the safety data sheet
Nano3D Systems LLC
1110 NE Circle Blvd.,
ATAMI/Bldg. 11
Corvallis, OR 97330

1.4 Emergency telephone number
Emergency number: CHEMTREC: 1-800-424-9300

Section 2: Hazard(s) identification

2.1 Classification of the substance or mixture
Classification (GHS-US)
- Acute toxicity, Oral (Category 4) H302
- Skin irritation (Category 2) H315
- Eye irritation (Category 2A) H319
- Acute aquatic toxicity (Category 1) H400
- Chronic aquatic toxicity (Category 2) H410

2.2 Label elements
GHS-US labeling
Hazard pictogram (GHS-US)

Signal word (GHS-US): Danger

Hazard statements (GHS-US)
- H302 – Harmful if swallowed
- H315 – Causes skin irritation
- H317 – May cause an allergic reaction
- H318 – Causes serious eye damage
- H319 – Causes serious eye irritation
- H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled
- H341 – Suspected of causing genetic defects
- H350 – May cause cancer
- H360 – May damage fertility or the unborn child
- H372 – Causes damage to organs through prolonged or repeated exposure
- H410 - Very toxic to aquatic life with long lasting effects
Precautionary statements (GHS-US):

- P201 – Obtain special instructions before use
- P202 – Do not handle until all safety precautions have been read and understood
- P260 – Do not breathe dust/fume/gas/mist/vapors/spray
- P264 – Wash hands thoroughly after handling
- P270 – Do not eat, drink or smoke when using this product
- P272 – Contaminated work clothing should not be allowed out of the workplace
- P273 – Avoid release to the environment
- P280 – Wear protective gloves/protective clothing/ eye protection/face protection
- P284 – [In case of inadequate ventilation] wear respiratory protection
- P301+P312+P330 – If swallowed: Call a poison center/doctor if you feel unwell. Rinse mouth
- P302+P352 – If on skin: Wash with plenty of water
- P304+P340 – If inhaled: Remove person to fresh air and keep comfortable for breathing
- P305+P351+P338+P310 – If in eye: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a poison center or doctor/physician
- P308+P3313 – If exposed or concerned: Get medical advice/attention
- P310 – Immediately call a poison center/doctor
- P332+P313 – If skin irritation occurs: Get medical advice/attention.
- P337+P313 – If eye irritation persists: Get medical advice/attention.
- P362 – Take off contaminated clothing and wash before reuse
- P363 – Wash contaminated clothing and wash before reuse
- P391 – Collect spillage.
- P501 – Dispose of contents/ container to an approved waste disposal plant.

2.3 Other Hazards

No additional information available

2.4 Unknown acute toxicity (GHS US)

No additional information available

Section 3: Composition/information on ingredients
Electroless Copper Plating Solution

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3.1 Substance

Not applicable

3.2 Mixture

<table>
<thead>
<tr>
<th>Name</th>
<th>Product Identifier</th>
<th>%</th>
<th>Classification (GHS-US)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper(II) Sulfate</td>
<td>(CAS-No.) 23254-43-5</td>
<td>Trade Secret</td>
<td>Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Aquatic Acute 1; Aquatic Chronic 1; H302, H315, H319, H410</td>
</tr>
<tr>
<td>Ethylenediaminetetraacetic acid</td>
<td>(CAS-No.) 60-00-4</td>
<td>Trade Secret</td>
<td>Eye Irrit. 2A; H319</td>
</tr>
<tr>
<td>Glyoxylic acid monohydrate</td>
<td>(CAS-No.) 563-96-2</td>
<td>Trade Secret</td>
<td>Eye Dam. 1; Skin Sens. 1; H317, H318</td>
</tr>
<tr>
<td>Nonylphenol ethoxylate phosphate</td>
<td>(CAS-No.) 68412-53-3</td>
<td>Trade Secret</td>
<td>Acute Tox. 4; Skin irrit. 2; eye irrit. 1; Aquatic Acute 2; Aquatic Chronic 2</td>
</tr>
</tbody>
</table>

Section 4: First Aid Measures

4.1 Description of first aid measures

General: Consult a physician. Show this safety data sheet to the doctor in attendance. Move out of dangerous area.

Inhalation: If breathed in, move person into fresh air. If not breathing, give artificial respiration. Consult a physician.

Skin contact: Wash off with soap and plenty of water. Consult a physician.

Eye contact: Rinse thoroughly with plenty of water for at least 15 minutes and consult a physician.

Ingestion: Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

Inhalation: May cause allergy or asthma symptoms or breathing difficulties if inhaled

Skin contact: May cause an allergic reaction

Eye contact: Causes serious eye damage

Ingestion: Harmful if swallowed
4.3 Indication of any immediate medical attention and special treatment needed
No further information available

Section 5: Firefighting measures

5.1 Extinguishing media
Suitable extinguishing media: Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable extinguishing media: None

5.2 Special hazards arising from the substance or mixture
Fire hazard: No information available
Explosion hazard: No information available

5.3 Advice for firefighters
Protection during firefighting: Wear self-contained breathing apparatus for firefighting if necessary.

Section 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
6.1.1 For non-emergency personnel: Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust.

6.1.2 For emergency personnel: No additional information available

6.2 Environmental precautions
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

6.3 Methods and materials for containment and cleaning up
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.
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Section 7: Handling and storage

7.1 Precautions for safe handling

Precautions for safe handling  : Avoid contact with skin and eyes. Avoid formation of aerosols.

7.2 Conditions for safe storage, including any incompatibilities

Storage conditions  : Keep container tightly closed in a dry and well-ventilated place.

Air sensitive, hygroscopic. Handle and store under inert gas.

Storage class (TRGS 510): Non Combustible Solids.

Section 8: Exposure controls/personal protection

8.1 Control parameters

<table>
<thead>
<tr>
<th>Compound</th>
<th>CAS-No.</th>
<th>Control parameters</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5</td>
<td></td>
<td>TWA 1.000000 mg/m³ USA. NIOSH Recommended Exposure Limits</td>
</tr>
<tr>
<td>Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4</td>
<td></td>
<td>No exposure limit values</td>
</tr>
<tr>
<td>Glyoxylic acid (CAS-No.) 563-96-2</td>
<td></td>
<td>No exposure limit values</td>
</tr>
<tr>
<td>Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3</td>
<td></td>
<td>PEL 1 mg/m³ US. OSHA Table Z-1 Limits for Air Contaminants</td>
</tr>
</tbody>
</table>

8.2 Exposure controls

Appropriate engineering controls  : Handle in accordance with good industrial hygiene and safety practice. Wash hands before breaks and at the end of workday.

Hand protection  : Handle with gloves. Gloves must be inspected prior to use. Use proper glove removal technique (without touching glove's outer surface) to avoid skin contact with this product. Dispose of contaminated gloves after use in accordance with
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applicable laws and good laboratory practices. Wash and dry hands.

Eye protection : Safety glasses with side-shields conforming to EN166 Use equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).

Skin and body protection : Complete suit protecting against chemicals, the type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection : Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Section 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Physical state</td>
<td>Liquid</td>
</tr>
<tr>
<td>Color</td>
<td>Blue</td>
</tr>
<tr>
<td>Odor</td>
<td>No information available</td>
</tr>
<tr>
<td>Odor threshold</td>
<td>No information available</td>
</tr>
<tr>
<td>pH</td>
<td>No information available</td>
</tr>
<tr>
<td>Melting point</td>
<td>No information available</td>
</tr>
<tr>
<td>Freezing point</td>
<td>No information available</td>
</tr>
<tr>
<td>Boiling point</td>
<td>No information available</td>
</tr>
<tr>
<td>Flash point</td>
<td>No information available</td>
</tr>
<tr>
<td>Relative evaporation rate (butyl acetate = 1)</td>
<td>No information available</td>
</tr>
<tr>
<td>Flammability (solid, gas)</td>
<td>No information available</td>
</tr>
<tr>
<td>Explosion limits</td>
<td>No information available</td>
</tr>
<tr>
<td>Explosive properties</td>
<td>No information available</td>
</tr>
<tr>
<td>Vapor pressure</td>
<td>No information available</td>
</tr>
<tr>
<td>Relative density</td>
<td>No information available</td>
</tr>
<tr>
<td>Relative vapor density at 20 °</td>
<td>No information available</td>
</tr>
<tr>
<td>Solubility</td>
<td>Miscible</td>
</tr>
<tr>
<td>Log Pow</td>
<td>No information available</td>
</tr>
<tr>
<td>Auto-ignition temperature</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity, kinematic</td>
<td>No information available</td>
</tr>
<tr>
<td>Viscosity, dynamic</td>
<td>No information available</td>
</tr>
</tbody>
</table>

9.2 Other information

No further information available
### Section 10: Stability and reactivity

**10.1 Reactivity**
No information available

**10.2 Chemical Stability**
Stable under recommended storage conditions.

**10.3 Possibility of hazardous reactions**
No information available

**10.4 Conditions to avoid**
Air sensitive. hygroscopic

**10.5 Incompatible materials**
Strong oxidizing agents, Bases, reducing agent Powdered metals, Anhydrous copper(II) sulfate, reacts violently with: hydroxylamine, Magnesium,

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Sulphur oxides, Copper oxides
Other decomposition products - No data available

### Section 11: Toxicological information

**11.1 Control parameters**

<table>
<thead>
<tr>
<th>Compound</th>
<th>Acute toxicity</th>
<th>Skin corrosion/irritation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5</td>
<td>No information available</td>
<td>Causes skin corrosion</td>
</tr>
<tr>
<td>Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4</td>
<td>LD50 Oral - Rat - male and female - 4,500 mg/kg</td>
<td></td>
</tr>
<tr>
<td>Glyoxylic acid (CAS-No.) 563-96-2</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3</td>
<td>LD50 Oral Rat &gt; 1000 mg/kg</td>
<td>LD50 Dermal Rabbit &gt; 2000 mg/kg</td>
</tr>
</tbody>
</table>
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Serious eye damage/irritation : Risk of serious damage to eyes

Respiratory or skin sensitization : Prolonged or repeated exposure may cause allergic reactions in certain sensitive individuals.

Germ cell mutagenicity : No information available

Carcinogenicity : No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC, NTP or OSHA.

Reproductive toxicity : Possible risk of congenital malformation in the fetus.

Specific target organ toxicity (single exposure) : No information available

Specific target organ toxicity (repeated exposure) : No information available

Aspiration hazard : No information available

Additional information

Symptoms of systemic copper poisoning may include: capillary damage, headache, cold sweat, weak pulse, and kidney and liver damage, central nervous system excitation followed by depression, jaundice, convulsions, paralysis, and coma. Death may occur from shock or renal failure. Chronic copper poisoning is typified by hepatic cirrhosis, brain damage and demyelination, kidney defects, and copper deposition in the cornea as exemplified by humans with Wilson’s disease. It has also been reported that copper poisoning has led to hemolytic anemia and accelerates arteriosclerosis., To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Section 12: Ecological information

12.1 Toxicity

| Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5 | EC50 - Daphnia magna (Water flea) - 0.024 mg/l - 48 h |
| Toxicty to daphnia and other aquatic invertebrates |

| Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4 | static test LC50 - Lepomis macrochirus (Bluegill sunfish) - 41 mg/l-96 h |
| Toxicity to fish |

| Toxicity to daphnia and other aquatic invertebrates | static test EC50 - Daphnia magna (Water flea) - 625 mg/l - 48 h |

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<table>
<thead>
<tr>
<th>Compound</th>
<th>EC50</th>
<th>EC50</th>
<th>LC50</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glyoxylic acid (CAS-No.) 563-96-2</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>No information available</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Algae</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Crustacea</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fish</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC50 Algae &gt; 1 mg/l, 72 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>EC50 Daphnia &gt; 1 mg/l, 48 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>LC50 Fish &gt; 1 mg/l, 96 hours</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### 12.2 Persistence and degradability

<table>
<thead>
<tr>
<th>Compound</th>
<th>Persistence</th>
<th>Degradability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Glyoxylic acid (CAS-No.) 563-96-2</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3</td>
<td>Expected to be inherently biodegradable</td>
<td></td>
</tr>
</tbody>
</table>

### 12.3 Bioaccumulative potential

<table>
<thead>
<tr>
<th>Compound</th>
<th>Bioaccumulation</th>
<th>Bioconcentration factor (BCF)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5</td>
<td>Lepomis macrochirus - 28 d - 80 μg/l</td>
<td></td>
</tr>
<tr>
<td>Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4</td>
<td>Bioconcentration factor (BCF): 1.8</td>
<td></td>
</tr>
<tr>
<td>Glyoxylic acid (CAS-No.) 563-96-2</td>
<td>No information available</td>
<td></td>
</tr>
<tr>
<td>Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3</td>
<td>No information available</td>
<td></td>
</tr>
</tbody>
</table>

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12.4 Mobility in soil

Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5
No information available

Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4

Glyoxylic acid (CAS-No.) 563-96-2
No information available

Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3
No information available

Compound

12.4 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal. Very toxic to aquatic life. May be harmful to aquatic organisms due to the shift of the pH. Avoid release to the environment.

Section 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material. Dissolve or mix the material with a combustible solvent and burn in a chemical incinerator equipped with an afterburner and scrubber.

Contaminated packaging
Dispose of as unused product.

Section 14: Transportation information

14.1 Transportation information

Department of Transportation (DOT)

UN number: 3077  Class: 9  Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Copper(II) sulfate hydrate)
Reportable Quantity (RQ): 10 lbs
Marine pollutant: yes
Poison Inhalation Hazard: No
# Electroless Copper Plating Solution

## Safety Data Sheet

### Section 15: Regulatory information

#### 15.1 US Federal regulations

<table>
<thead>
<tr>
<th>Substance</th>
<th>Regulations</th>
</tr>
</thead>
</table>
| Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5 | SARA Title III, Section 313  
SARA 311/312 Hazards Acute Health Hazard, Chronic Health Hazard |
| Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4 | SARA 311/312 Hazards Acute Health Hazard                                     |
| Glyoxylic acid (CAS-No.) 563-96-2              | SARA 311/312 Hazards Acute Health Hazard                                     |
| Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3 | CERCLA Hazardous Substance List  
SARA 311/312 Hazardous chemical  
Clean Water Act (CWA) Section 112(r) (40 CFR 68.130) |

#### 15.2 US State regulations

<table>
<thead>
<tr>
<th>Substance</th>
<th>States</th>
</tr>
</thead>
</table>
| Copper(II) Sulfate Hydrate (CAS-No.) 23254-43-5 | Massachusetts Right To Know  
Pennsylvania Right To Know  
New Jersey Right To Know |
| Ethylenediaminetetraacetic acid (CAS-No.) 60-00-4 | Massachusetts Right To Know  
Pennsylvania Right To Know  
New Jersey Right To Know |
| Glyoxylic acid (CAS-No.) 563-96-2              | Massachusetts Right To Know  
Pennsylvania Right To Know  
New Jersey Right To Know |
| Nonylphenol ethoxylate phosphate (CAS-No.) 68412-53-3 | Massachusetts Right To Know  
Pennsylvania Right To Know  
Pennsylvania Worker and Community Right-to-Know  
New Jersey Right To Know  
Rhode Island Right To Know |
Section 16: Other information

HMIS Rating
Health 2
Chronic Health *
Flammability 1
Physical 0

NFPA Rating
Health 2
Fire 1
Reactivity 0

SDS Preparation date: March 1, 2017  Supersedes previous version: New SDS

This SDS contains revisions in the following sections(s): Not applicable. New SDS.

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Nano3D Systems LLC be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Nano3D Systems LLC has been advised of the possibility of such damages.

End of Safety Data Sheet