Electroless CoWBP Plating Solution

Safety Data Sheet

Section 1: Identification

1.1 Identification
Product Name: Electroless CoWBP Plating Solution

1.2 Relevant identified uses of the substance or mixture and uses advised against
Use of the substance/mixture: Cobalt-Tungsten-Boron-Phosphorous 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 3) H301
Acute toxicity, Dermal (Category 3) H311
Skin sensitization (Category 1) H317
Respiratory sensitization (Category 1) H334
Carcinogenicity (Category 1B) H350
Reproductive toxicity (Category 1B) H360
Reproductive toxicity (Category 2) H361
Acute aquatic toxicity (Category 1) H400
Chronic aquatic toxicity (Category 1) H410

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

Signal word (GHS-US): Danger

Hazard statements (GHS-US)
H301 + H311 – Toxic if swallowed or in contact with skin
H317 – May cause an allergic skin reaction.
H334 – May cause allergy or asthma symptoms or breathing difficulties if inhaled
H350 – May cause cancer.
H360 – May damage fertility or the unborn child.
H361 – Suspected of damaging fertility or the unborn child
H410 – Very toxic to aquatic life with long lasting effects
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Precautionary statements (GHS-US)

: P201 – Obtain special instructions before use.
: P202 – Do not handle until all safety precautions have been read and understood.
: P261 – Avoid breathing dust/fume/gas/mist/vapors/spray.
: P264 – Wash skin 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.
: P301 + P310 – If swallowed: Call a Poison center or doctor/physician if you feel unwell. Rinse mouth.
: P302 + P352 – If on skin: Wash with plenty of soap and water.
: P304 + P341 – If inhaled: If breathing is difficult, remove victim to fresh air and keep at rest in a position comfortable for breathing.
: P308 + P313 – If exposed or concerned: Get medical advice/attention.
: P312 - Call a POISON CENTER or doctor/physician if you feel unwell.
: P330 – Rinse mouth.
: P333 + P313 – If skin irritation or rash occurs: Get medical advice/attention.
: P361 - Remove/Take off immediately all contaminated clothing.
: P363 – Wash contaminated clothing before reuse.
: P391 – Collect spillage.
: P405 – Store locked up.
: 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

3.1 Substance
Not applicable
Electroless CoWBP Plating Solution
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### 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>Cobalt(II) Sulfate Heptahydrate</td>
<td>(CAS-No.) 10026-24-1</td>
<td>Trade Secret</td>
<td>Acute Tox. 4; Resp. Sens. 1; Skin Sens. 1; Carc. 1B; Repr. 1B; Aquatic Acute 1; Aquatic Chronic 1; H302, H317, H334, H350, H360, H410</td>
</tr>
<tr>
<td>Boric acid</td>
<td>(CAS-No.) 10043-35-3</td>
<td>Trade Secret</td>
<td>Repr. 2; H361</td>
</tr>
<tr>
<td>Tungstic acid</td>
<td>(CAS-No.) 7783-03-1</td>
<td>Trade Secret</td>
<td>Not a hazardous substance</td>
</tr>
<tr>
<td>Dimethylamine-Borane</td>
<td>(CAS-No.) 74-94-2</td>
<td>Trade Secret</td>
<td>Flam. Sol. 1; Acute Tox. 3; H228, H301 + H311</td>
</tr>
<tr>
<td>Ammonium Hypophosphite</td>
<td>(CAS-No.) 7803-65-8</td>
<td>Trade Secret</td>
<td>Skin Irrit. 2; Eye Irrit. 2A; STOT SE 3; H315; H319; H335</td>
</tr>
<tr>
<td>Citric Acid Monohydrate</td>
<td>(CAS-No.) 5949-29-1</td>
<td>Trade Secret</td>
<td>Eye Irrit. 2A; H319</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
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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: Cobalt oxide, sulfur oxides, boron oxides, sodium oxides, tungsten oxides, phosphorous oxides, carbon oxides, nitrogen oxides (NOx), Borane/boron oxides
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. Wear respiratory protection. 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.
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6.4 Reference to other sections
For disposal see section 13.

Section 7: Handling and storage

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

7.2 Conditions for safe storage, including any incompatibilities
Storage conditions: Store in cool place. Keep container tightly closed in a dry and well-ventilated place.


Section 8: Exposure controls/personal protection

8.1 Control parameters

<table>
<thead>
<tr>
<th>Substance</th>
<th>TWA</th>
<th>USA. ACGIH Threshold Limit Values (TLV)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt Sulfate Heptahydrate (CAS-No.) 10026-24-1</td>
<td>0.02 mg/m$^3$</td>
<td></td>
</tr>
<tr>
<td>Boric acid (CAS-No.) 10043-35-3</td>
<td>2.00 mg/m$^3$</td>
<td></td>
</tr>
<tr>
<td>Tungstic Acid (CAS-No.) 7783-03-1</td>
<td>No exposure limit values</td>
<td></td>
</tr>
<tr>
<td>Ammonium Hypophosphate (CAS-No.) 7803-65-8</td>
<td>No exposure limit values</td>
<td></td>
</tr>
<tr>
<td>Citric Acid Monohydrate (CAS-No.) 5949-29-1</td>
<td>No exposure limit values</td>
<td></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 applicable laws and good laboratory practices.
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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>Red</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>9</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
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**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**
No information available

**10.5 Incompatible materials**
Strong oxidizing agents, Potassium, Acid anhydrides

**10.6 Hazardous decomposition products**
Hazardous decomposition products formed under fire conditions. - Sulphur oxides, Cobalt oxides, Tungsten oxides, Sodium Oxides, Carbon oxides

**Section 11: Toxicological information**

**11.1 Control parameters**
Acute toxicity

**Cobalt Sulfate Heptahydrate (CAS-No.) 10026-24-1**
LD50 Oral - Rat - 582 mg/kg

**Boric acid (CAS-No.) 10043-35-3**
LD50 Oral - Rat - 2,660 mg/kg

**Dimethylamine-borane (CAS-No.) 74-94-2**
LD50 Oral – rat – 59 mg/kg
Inhalation: no data available
LD50 Dermal – rabbit – 210 mg/kg

**Citric Acid Monohydrate (CAS-No.) 10043-35-3**
LD50 Intraperitoneal - Rat - 375 mg/kg

- 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: Hamster, Embryo, Micronucleus test
- Carcinogenicity: This is or contains a component that has been
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Reported to be carcinogenic based on its IARC, OSHA, ACGIH, NTP, or EPA classification.

Possible human carcinogen

Reproductive toxicity: Presumed human reproductive toxicant

Reproductive toxicity - Mouse – Inhalation


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

Toxicity reported for borates in humans: ingestion or absorption may cause nausea, vomiting, diarrhea, abdominal cramps, and erythematous lesions on the skin and mucous membranes. Other symptoms include: circulatory collapse, tachycardia, cyanosis, delirium, convulsions, and coma. Death has been reported to occur in infants from less than 5 grams and in adults from 5 to 20 grams.

Section 12: Ecological information

12.1 Toxicity

Cobalt Sulfate Heptahydrate (CAS-No.) 10026-24-1
No information available

Boric acid (CAS-No.) 10043-35-3

Toxicity to fish
LC50 - Ptychocheilus lucius - 279 mg/l - 96 h
LC0 - Lepomis macrochirus (Bluegill) - > 1,021 mg/l - 96 h

Toxicity to daphnia and other aquatic invertebrates
LC50 - Daphnia magna (Water flea) - 53.2 mg/l - 21 d
EC50 - Daphnia magna (Water flea) - 133 mg/l - 48 h

12.2 Persistence and degradability

Cobalt Sulfate Heptahydrate (CAS-No.) 10026-24-1
Not readily biodegradable

12.3 Bioaccumulative potential
No information available
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12.4 Mobility in soil
No information available

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: 2810 Class: 6.1 Packing group: II
Proper shipping name: toxic liquids, organic, n.o.s. (dimethylamine-borane and cobalt sulfate mixture)
Marine pollutant: Yes
Poison Inhalation Hazard: No

IMDG

IMDG UN number: 2810 Class: 6.1 Packing group: II EMS-No: F-A, S-G
Proper shipping name: toxic liquids, organic, n.o.s. (dimethylamine-borane and cobalt sulfate mixture)
Marine pollutant: yes

IATA

UN number: 2810 Class: 6.1 Packing group: II
Proper shipping name: toxic liquids, organic, n.o.s. (dimethylamine-borane and cobalt sulfate mixture)

Section 15: Regulatory information

15.1 US Federal regulations

Cobalt Sulfate Heptahydrate (CAS-No.) 10026-24-1
SARA Title III, Section 313
SARA 311/312 Hazards Acute Health Hazard, Chronic Health Hazard
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**Boric acid (CAS-No.) 10043-35-3**
SARA 311/312 Hazards Chronic Health Hazard

**Ammonium Phosphinate (CAS-No.) 7803-65-8**
SARA 311/312 Acute Health Hazards

**Citric Acid Monohydrate (CAS-No.) 5949-29-1**
SARA 311/312 Acute Health Hazard

15.2 US State regulations

**Cobalt Sulfate Heptahydrate (CAS-No.) 10026-24-1**
Pennsylvania Right To Know
New Jersey Right To Know
California Prop 65

**Boric acid (CAS-No.) 10043-35-3**
Pennsylvania Right To Know
New Jersey Right To Know

**Tungstic Acid (CAS-No.) 7783-03-1**
Pennsylvania Right To Know

**Ammonium Phosphinate (CAS-No.) 7803-65-8**
Pennsylvania Right To Know
New Jersey Right To Know

**Citric Acid Monohydrate (CAS-No.) 5949-29-1**
Pennsylvania Right To Know
New Jersey Right To Know

**Dimethylamine-Borane (CAS-No.) 74-94-2**
Pennsylvania Right To Know
New Jersey Right To Know

Section 16: Other information

Full text of H-Statements referred to under sections 2 and 3.

- Acute Tox.
- Acute toxicity
- Aquatic Acute
- Acute aquatic toxicity
- Aquatic Chronic
- Chronic aquatic toxicity
- Carc.
- Carcinogenicity
- Eye Irrit.
- Eye irritation
- Flam Sol.
- Flammable solids
- H228
- Flammable solid
- H301
- Toxic if swallowed
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H301+H311 Toxic if swallowed or in contact with skin
H302 Harmful if swallowed
H311 Toxic in contact with skin
H315 Causes skin irritation
H317 May cause an allergic skin reaction
H319 Causes serious eye irritation
H334 May cause allergy or asthma symptoms or breathing difficulties if inhaled
H335 May cause respiratory irritation
H350 May cause cancer
H360 May damage fertility or the unborn child
H400 Very toxic to aquatic life
H410 Very toxic to aquatic life with long lasting effects
Skin Irrit. Skin irritation
STOT SE Specific target organ toxicity - single exposure

HMIS Rating
Health 2
Chronic Health *
Flammability 0
Physical 3

NFPA Rating
Health 2
Fire 0
Reactivity 3

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

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

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