MATERIAL SAFETY DATA SHEET
CONDUCTIVE SILVER PRINTING PASTE

SECTION 1: Identification of the substance / mixture and of the company / undertaking

1.1 Product Identifiers
Product name: CONDUCTIVE SILVER PRINTING PASTE
Brand: DML DM-SIP
Product codes: DM-SIP-3061S

1.2 Relevant identified uses of the substance or mixture and uses advised against
Identified uses: Laboratory chemicals, Manufacture of substances

1.3 Details of the supplier of the safety data sheet
Company: Dycotec Materials Ltd
Unit 12 Star West, Westmead Drive, Westlea, Swindon, Wiltshire SN5 7SW, UK
Telephone: +44 (0) 1788 814025
E-mail address: info@dycotecmaterials.com

1.4 Emergency telephone number
Emergency Phone No.: +44 (0) 7495 248908

SECTION 2: Hazards Identification

2.1 Classification of the substance or mixture
Classification (EC 1272/2008)
Acute toxicity, Oral (Category 4), H302
Serious eye damage (Category 1), H318
Specific target organ toxicity - single exposure (Category 3), H336
Chronic aquatic toxicity (Category 3), H412

2.2 Label elements
Pictogram

Signal word: Danger
Hazard statements:
H302 Harmful if swallowed.
H318 Causes serious eye damage.
H336 May cause drowsiness or dizziness.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statements:
P261 Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P280 Wear protective gloves/ eye protection/ face protection.
P305 + P351 + P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.

2.3 Other hazards
This substance/mixture contains no components considered to be either persistent, bioaccumulative and toxic (PBT), or very persistent and very bioaccumulative (vPvB) at levels of 0.1% or higher.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

3.2 Mixtures
Hazardous ingredients according to Regulation (EC) No 1272/2008

<table>
<thead>
<tr>
<th>Component / CAS #</th>
<th>EC #</th>
<th>%</th>
<th>Classification</th>
</tr>
</thead>
</table>
SECTION 4: FIRST AID MEASURES

4.1 Description of first aid measures

Inhalation
Remove to fresh air. If breathing is difficult, give oxygen. Apply artificial respiration if patient is not breathing. Obtain medical attention immediately.

Ingestion
If swallowed, call a physician immediately. Only induce vomiting at the instruction of a physician. Never give anything by mouth to an unconscious person.

Skin contact
Remove contaminated clothing and shoes without delay. Wear impermeable gloves. Wash immediately with plenty of water. Pay particular attention to skin crevices, nail folds, etc. Do not reuse contaminated clothing without laundering. Do not reuse contaminated leatherware. Obtain medical attention.

Eye contact
Rinse thoroughly with plenty of water for at least 15 minutes. Obtain medical attention immediately.

4.2 Most important symptoms and effects, both acute and delayed

None known

4.3 Indication of any immediate medical attention and special treatment needed

Not applicable

SECTION 5: FIRE-FIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media
Use water spray, alcohol foam, carbon dioxide or dry chemical to extinguish fires. Water stream may be ineffective.

5.2 Special hazards arising from the substance or mixture

Keep containers cool by spraying with water if exposed to fire.

5.3 Advice for firefighters

Protective Equipment:
Firefighters, and others exposed, wear self-contained breathing apparatus. Wear full firefighting protective clothing. See MSDS Section 8 (Exposure Controls/Personal Protection).

5.4 Further information

No data available

SECTION 6: ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid dust formation. Avoid breathing vapors, mist or gas. Ensure adequate ventilation. Evacuate personnel to safe areas. Avoid breathing dust. For personal protection see section 8.

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

Wipe up with absorbent material (e.g. cloth, fleece) 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.

SECTION 7: HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist. Provide appropriate exhaust ventilation at places where dust is formed. For precautions see section 2.2.
7.2 Conditions for safe storage, including any incompatibilities
Areas containing this material should have fire safe practices and electrical equipment in accordance with applicable regulations and/or guidelines. Standards are primarily based on the material’s flashpoint, but may also take into account properties such as miscibility with water or toxicity. All local and national regulations should be followed. Store in a cool, dry, well ventilated place and keep container tightly closed. Avoid flammable gas mixtures. Take precautionary measures against electrostatic loading - earthing necessary during loading operations.
Hygroscopic.

Storage Temperature: Fridge, +4°C
Storage class (TRGS 510): Non-combustible

7.3 Specific end use(s)
Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters – Components with workplace control parameters

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value Form of exposure</th>
<th>Control parameter</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td>7440-22-4</td>
<td>TWA</td>
<td>0.1 mg/m³</td>
<td>UK, EH40 WEL – Workplace Exposure Limits</td>
</tr>
</tbody>
</table>

Remarks: Where no specific short-term exposure limit is listed, a figure three times the long-term exposure should be used.

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS-No.</th>
<th>Value Form of exposure</th>
<th>Control parameter</th>
<th>Basis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td>7440-22-4</td>
<td>TWA</td>
<td>0.1 mg/m³</td>
<td>Europe, Commission Directive 2000/39/EC establishing a first list of indicative occupational exposure limit values</td>
</tr>
</tbody>
</table>

8.2 Exposure Controls

Protective equipment

Appropriate engineering controls
Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Eye/face protection
Use approved safety glasses with side shields. Eyewear complying with an approved standard should be worn if a risk assessment indicate eye contact is possible. The following protection should be worn: Chemical splash goggles or face shield.

Skin protection
Prevent contamination of skin or clothing when removing protective equipment. Barrier creams may be used in conjunction with the gloves to provide additional skin protection. Wear impermeable gloves and suitable protective clothing.

Hand protection
Use neoprene, nitrile, or rubber gloves to prevent skin contact. Gloves must be inspected prior to use. The selected protective gloves have to satisfy the specifications of EU Directive 89/686/EEC and the standard EN 374 derived from it. Wear protective gloves made of the following material: Nitrile rubber. The most suitable glove should be chosen in consultation with the glove supplier/manufacturer, who can provide information about the breakthrough time of the glove material. 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. Wash and dry hands.

Hygiene measures
Do not smoke in work area. Wash hands thoroughly after handling. Promptly remove any clothing that becomes contaminated. When using do not eat, drink or smoke. Contaminated clothing should be placed in a closed container for disposal of decontamination. Warn cleaning personnel of any hazardous properties of the product.

Respiratory protection
Where risk assessment shows air-purifying respirators are appropriate use a full-face particulates respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
Prevent further leakage or spillage if safe to do so. Do not let product enter drains. Discharge into the environment must be avoided.

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>Appearance</td>
<td>Paste</td>
</tr>
<tr>
<td>Colour</td>
<td>Cream Silver</td>
</tr>
<tr>
<td>Odour</td>
<td>No data available</td>
</tr>
<tr>
<td>Odour Threshold</td>
<td>No data available</td>
</tr>
<tr>
<td>pH</td>
<td>No data available</td>
</tr>
</tbody>
</table>
Melting / freezing point: No data available
Initial boiling point and boiling range: No data available
Flash point: No data available
Evaporation rate: No data available
Flammability (solid, gas): No data available
Upper/lower flammability or explosive limits: No data available
Vapour pressure: No data available
Vapour density: No data available
Relative density: No data available
Water solubility: No data available
Partition coefficient: No data available
Auto-ignition temperature: No data available
Decomposition temperature: No data available
Viscosity: No data available
Explosive properties: No data available
Oxidizing properties: No data available

9.1 Other information
No data available

SECTION 10: STABILITY AND REACTIVITY

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents, Strong bases, Strong acids.

10.6 Hazardous decomposition products
Other decomposition products - no data available
In the event of fire - see section 5

SECTION 11: TOXICOLOGICAL INFORMATION

Acute toxicity:
LD50 Oral - Rat - 1,540 mg/kg (γ-Butyrolactone)
Remarks: Behavioral:Altered sleep time (including change in righting reflex). Behavioral:Somnolence
(general depressed activity). Respiratory disorder
LC50 Inhalation - Rat - 4 h - > 5,100 mg/m3
LD50 Dermal - Guinea pig - > 5,000 mg/kg
LD50 Oral - Rat - male and female - > 2,000 mg/kg (Benzyl acetate)
(OECD Test Guideline 401)
LCl0 Inhalation - Rat - male and female - 4 h - > 0.766 mg/l
(OECD Test Guideline 403)
LD50 Dermal - Rabbit - > 5,000 mg/kg

Skin corrosion/irritation:
Skin – Rabbit (Benzyl acetate)
Result: No skin irritation - 4 h

Serious eye damage/eye irritation:
Eyes – Rabbit (Benzyl acetate)
Result: No eye irritation
(Directive 67/548/EEC, Annex V, B.5.)

Respiratory or skin sensitization:
No data available

Germ cell mutagenicity:
No data available

Carcinogenicity
Carcinogenicity - Rat - Oral
Tumorigenic:Neoplastic by RTECS criteria. Gastrointestinal:Tumors.
Aldrich - B15805 Page 6 of 7
Carcinogenicity - Mouse - Oral
Tumorigenic:Neoplastic by RTECS criteria. Liver:Tumors.
IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (Benzyl acetate).

Reproductive toxicity:
No data available

Specific target organ toxicity – single exposure:
No data available

**Specific target organ toxicity – repeated exposure:**
No data available

**Aspiration hazard:**
No data available

**Additional Information:**
Liver - Irregularities - Based on Human Evidence (γ-Butyrolactone)
an anesthetic effect on the central nervous system characterized by a loss of sensation., Preliminary excitement is the initial effect followed by relaxation, stupor, or sleep., Nausea, Dizziness, Headache
Repeated dose toxicity (Benzy acetate)
Rat - male and female - Oral - 14 h - NOAEL : 500 mg/kg
narcosis, Central nervous system depression, Nausea, Vomiting

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**SECTION 12: ECOLOGICAL INFORMATION**

**TOXICITY, PERSISTENCE AND DEGRADABILITY, BIOACCUMULATIVE POTENTIAL, MOBILITY IN SOIL, OTHER ADVERSE EFFECTS**

**HAZARDOUS INGREDIENT TOXICITY DATA**

<table>
<thead>
<tr>
<th>Component / CAS #</th>
<th>Toxicity to Algae</th>
<th>Toxicity to Fish</th>
<th>Toxicity to Water Flea</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver 7440-22-4</td>
<td>No data available</td>
<td>No data available</td>
<td>No data available</td>
</tr>
<tr>
<td>Benzy Acetate 140-11-4</td>
<td>Growth inhibition EC50 - Desmodesmus subspicatus (Scenedesmus subspicatus) - 110 mg/l - 72 h (OECD Test Guideline 201)</td>
<td>flow-through test LC50 - Oryzias latipes - 4 mg/l - 96 h</td>
<td>Immobilization EC50 - Daphnia magna (Water flea) - 17 mg/l - 48 h (OECD Test Guideline 202)</td>
</tr>
<tr>
<td>γ-Butyrolactone 96-48-0</td>
<td>EC50 - Desmodesmus subspicatus (green algae) - 360 mg/l - 72 h</td>
<td>LC50 - Leuciscus idus (Golden orfe) - &gt; 220 mg/l - 96 h</td>
<td>EC50 - Daphnia magna (Water flea) - &gt; 500 mg/l - 48 h (Directive 67/548/EEC, Annex V, C.2.)</td>
</tr>
</tbody>
</table>

**Persistence and degradability**
Biodegradability Biotic/Aerobic - Exposure time 13 d (γ-Butyrolactone)
Result: 90 % - Readily biodegradable
Biochemical Oxygen Demand (BOD) 1,160 mg/g
Biodegradability aerobic - Exposure time 28 d (Benzy acetate)
Result: 100 % - Readily biodegradable
(OECD Test Guideline 301B)

**Bioaccumulative potential**
No data available

**Mobility in soil**
No data available

**Results of PBT and vPvB assessment**
No data available

**Other adverse effects**
Adsorbed organic bound. (γ-Butyrolactone)
Toxic to aquatic life. (Benzy acetate)

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**SECTION 13: DISPOSAL CONSIDERATIONS**

**13.1 Waste treatment methods**
The company encourages the recycle and reuse of products and packaging, where possible and permitted.

**General Information**
When handling waste, the safety precautions applying to handling of the product should be considered. Do not dump into any sewers, on the ground, or into any body of water. Not to be disposed of together with household waste. Any disposal practice must be in compliance with all local and national laws and regulations. Handle and dispose contaminated packages in the same way as the product itself.

**Disposal methods**
When recycle or reuse is not possible, the company recommends that our products, especially when classified as hazardous, be disposed of by thermal treatment or incineration at approved facilities. All local and national regulations should be followed. For disposal within the European Community, waste codes according to Directive 2008/98/EC should be assigned by the user based on the application for which the product was used.

**Disposal-relevant information**
Do not release directly or indirectly to surface water, ground water, soil or public sewage system.

**Contaminated packaging**
Dispose of as unused product.

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**SECTION 14: TRANSPORT INFORMATION**

**14.1 UN number**
14.2 UN proper shipping name

<table>
<thead>
<tr>
<th>ADR/RID</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
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</tbody>
</table>

14.3 Transport hazard class(es)

<table>
<thead>
<tr>
<th>ADR/RID</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Not dangerous goods</td>
<td>Not dangerous goods</td>
<td>Not dangerous goods</td>
</tr>
</tbody>
</table>

14.4 Packaging group

<table>
<thead>
<tr>
<th>ADR/RID</th>
<th>IMDG</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
</tbody>
</table>

14.5 Environmental hazards

<table>
<thead>
<tr>
<th>ADR/RID</th>
<th>IMDG Marine pollutant</th>
<th>IATA</th>
</tr>
</thead>
<tbody>
<tr>
<td>no</td>
<td>no</td>
<td>no</td>
</tr>
</tbody>
</table>

14.6 Special precautions for user

No data available

SECTION 15: REGULATORY INFORMATION

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture

This safety datasheet complies with the requirements of Regulation (EC) No. 1907/2006.
This safety datasheet complies with the requirements of Regulation (EC) No. 1272/2008.

15.2 Chemical Safety Assessment

no data available

SECTION 16: OTHER INFORMATION

Revision Date: 12-Dec-2016

General Information

The information contained herein is, to the best of our knowledge and belief, accurate. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Employers should use this information only as a supplement to other information gathered by them, and should make independent judgement of suitability of this information to ensure proper use and protect the health and safety of employees. This information is finished without warranty and any use of the product not in conformance with this Material Safety Data Sheet, or in combination with any other product or process, is the responsibility of the user. Since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by use of this material. It is the responsibility of the user to comply with all applicable local laws and regulations.

Hazard statements in full

H302 Harmful if swallowed.
H318 Causes serious eye damage.
H336 May cause drowsiness or dizziness.
H412 Harmful to aquatic life with long lasting effects.