SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

Product Identifier

Product name: Lead-Free Solder Paste (SnBiAg)
Synonyms: Water Soluble Solder Paste, Solder Cream, Solder Paste

Relevant identified uses of the substance or mixture and uses advised against

Intended use: Circuit board prototyping

Supplier's Details

Supplier Name: Voltera Inc.
Supplier Address 1: 100-113 Breithaupt St.
City: Kitchener
Province: Ontario
Postal Code: N2H5G9
Country: Canada
Business Phone: 1-888-381-3332

Emergency Phone Number

Emergency Phone: CANUTEC 1+ 613-996-6666

SECTION 2: HAZARDS IDENTIFICATION

GHS Class Phrases: Acute Tox. 4
Skin Sens. 1
Hazardous to the aquatic environment, short-term, acute Category 1
Hazardous to the aquatic environment, long-term, chronic Category 1

Label Elements

Signal Words: WARNING.
Hazard Statements:
H302 Harmful if swallowed
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
H410 Very toxic to aquatic life with long-lasting effects.

Precautionary Statements:
P102 Keep out of reach of children.
P201 Obtain special instructions before use.
P202 Do not handle until all safety precautions have been read and understood
P233 Keep container tightly closed
P260 Do not breathe dust/fume/gas/mist/vapor/spray
P262 Do not get in eyes, on skin, or on clothing
P264 Wash hands thoroughly after handling
P270 Do not eat, drink, or smoke when using this product
P271 Use in a well-ventilated area.
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/P330/P310 IF SWALLOWED: Rinse mouth. DO NOT induce vomiting. Immediately call a poison center/doctor.
P303/P361/P351/P338/P310 IF ON SKIN (or hair): Take off immediately all contaminated clothing. Wash with soap & water. Get medical advice / attention if skin irritation or rash occurs or if you feel unwell.
P304/P340/P312 IF INHALED: remove victim to fresh air and keep comfortable for breathing. Call a POISON CENTER or doctor/physician if you feel unwell.
P305/P351/P338/P310 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call POISON CENTER/Doctor.
P362 Take off contaminated clothing and wash it before reuse.
P391 Collect spillage.
P402/P404 Store in a dry place. Store in a closed container.
P405 Store locked up.
P501 Dispose of contents / container in accordance with local/regional/national/international regulations.

POTENTIAL HEALTH EFFECTS (CHRONIC AND OVEREXPOSURE)

Tin: Dust or fumes may cause irritation of the skin mucous membranes and may result in a benign Pneumoconiosis (Stannosis).
Silver: May cause discoloration of eyes and skin (Argyria)
Bismuth: May cause foul breath, a blue-black line on the gums, and Stomatitis.
Antimony: May cause gastrointestinal upset, sleeplessness, irritability, and muscular pain.
Indium: May cause weight loss, pulmonary edema, blood damage and degenerative changes in liver and kidneys.

MEDICAL CONDITIONS POSSIBLY AGGRAVATED BY EXPOSURE: Diseases of blood-forming organs, kidneys, nervous and possibly reproductive systems. Occupational Asthma.

SECTION 3: COMPOSITION/INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Component</th>
<th>CAS</th>
<th>% by Weight</th>
<th>Hazard Descriptions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modified Rosins (Rosin)</td>
<td>8050-09-7</td>
<td>&lt;45</td>
<td></td>
</tr>
<tr>
<td>Pine Oil Derivatives (Terpineol)</td>
<td>8000-41-7</td>
<td>&lt;5</td>
<td></td>
</tr>
<tr>
<td>Mixed Carboxylic Acids (Maleic acid)</td>
<td>110-16-7</td>
<td>&lt;4</td>
<td></td>
</tr>
<tr>
<td>Tin</td>
<td>7440-31-5</td>
<td>Not specified</td>
<td></td>
</tr>
<tr>
<td>Silver</td>
<td>7440-22-4</td>
<td>0.4</td>
<td>Acute oral toxicity (Category 4) Acute hazard to the aquatic environment (Category 1) Chronic hazard to the aquatic environment (Category 1)</td>
</tr>
<tr>
<td>Bismuth</td>
<td>7440-69-9</td>
<td>57.4</td>
<td></td>
</tr>
<tr>
<td>Hydrogenated Rosin</td>
<td>65997-06-0</td>
<td>3.0-9.0</td>
<td>Eye irritation (Category 2)</td>
</tr>
<tr>
<td>Tridecyl alcohol</td>
<td>68526-86-3</td>
<td>0.0-7.0</td>
<td>Acute hazard to the aquatic environment (Category 1) Chronic hazard to the aquatic environment (Category 1)</td>
</tr>
<tr>
<td>Alpha terpineol</td>
<td>98-55-5</td>
<td>1.0-7.0</td>
<td>Eye irritation (Category 2)</td>
</tr>
<tr>
<td>Malonic acid</td>
<td>141-82-2</td>
<td>0.25-0.28</td>
<td>Acute oral toxicity (Category 4) Serious eye damage (Category 1)</td>
</tr>
</tbody>
</table>

SECTION 4: FIRST AID MEASURES

Eye Contact: Immediately flush eyes with plenty of water for 15 to 20 minutes. Get medical attention, if irritation or symptoms of overexposure persists.

Skin Contact: Immediately wash skin with soap and plenty of water. Get medical attention if irritation develops or persists.

Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Seek immediate medical attention.
**Ingestion:** If swallowed, do NOT induce vomiting. Call a physician or poison control center immediately. Never give anything by mouth to an unconscious person.

**Other First Aid:** Exposures to soldering fumes and vapors may be irritating to eyes, respiratory system, and skin.

**Note to Physicians:** Provide general supportive measures and treat symptomatically.

### SECTION 5: FIRE-FIGHTING MEASURES

**Extinguishing Media:** Dry chemical, foam

**Special Firefighting Procedures:** Do not use water. Use NIOSH-approved self-contained Breathing Apparatus and full protective clothing if involved in a fire.

**Unusual Fire and Explosion Hazards:** May release Toxic metal and oxide fumes. High concentrations of dust may present explosion hazard. Water trapped below molten metal may explode thus spattering molten metal.

### SECTION 6: ACCIDENTAL RELEASE MEASURES

**Precautions and equipment:** Material is extremely thick and will not flow out.

**Accidental release measures:** If material spills or leaks use a spatula to collect and place it in a plastic or glass jar. Remove traces of residue using cloth rags or paper towels moistened with Isopropyl Alcohol. Exposure to spilled material may be irritating. Follow on-site personal protective equipment recommendations.

**Environmental precautions:** Avoid release to the environment. Collect spillage.

### SECTION 7: HANDLING AND STORAGE

**Handling / Storage:** Keep containers tightly closed when not in use. Use care to avoid spills. Avoid inhalation of fumes or dust. Avoid contact with eyes, skin, and clothing. Store in a closed corrosive resistant container, with corrosive resistant liner, in a cool dry place. Wear appropriate personal protective equipment when working with or handling. Always wash hands thoroughly after handling this product. Dispose of following Federal, State/Provincial, and Local regulations.

**Other Precautions:** Empty containers may retain product residues in vapor, liquid, and/or solid form. All labeled hazard precautions should be observed.

**Work Hygienic Practices:** Cosmetics/Food/Drink/Tobacco should not be consumed or used in work areas. Always wash hands after handling material and before applying or using cosmetics/food/drink/tobacco.

**Section 7 Notes:** For industrial use only. Keep out of reach of children. Not for internal consumption.

### SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

**Occupational Exposure Limit Values:**

**Rosin flux fumes (as total resin acids)**

**MEL:** 0.05 mg/m3 8h TWA.
MEL: 0.15 mg/m3 15 min.

Extraction is necessary to remove fumes during reflow. Also see section 3.

Engineering Controls: Use only with production equipment designed for use with solder paste.

Ventilation: Provide sufficient mechanical (general and/or local exhaust) ventilation to maintain exposure below TLVs.

Respiratory Protection: A (US: NIOSH; EU: EN 140:1998, EN 14387:2004 A) approved air-purifying respirator with fume/organic chemical cartridge should be worn when airborne concentrations may be exceeded. General and local exhaust ventilation is the preferred means of protection.

Eye Protection: Use with appropriate eye protection: Goggles or face shield (EU: EN 166-S 3 9)

Skins Protection: Protective gloves should be worn when the possibility of skin contact exists (EU: EN 374-1:2003).

Protective Clothing or Equipment: Work clothes should be worn and laundered in accordance with current Lead (Pb) Standards (US: OSHA)

Work Hygenic Practices: Cosmetics/Food/Drink/Tobacco should not be consumed or used in work areas. Always wash hands after handling material and before applying or using cosmetics/food/drink/tobacco.

Other: Maintain eye wash stations in work areas. Avoid the use of contact lenses in high ume areas. Clean protective equipment regularly. Clean up spills immediately.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Appearance</td>
<td>Grey paste</td>
</tr>
<tr>
<td>Odour</td>
<td>Odorless</td>
</tr>
<tr>
<td>Odour Threshold</td>
<td>NE</td>
</tr>
<tr>
<td>pH as Supplied</td>
<td>NA</td>
</tr>
<tr>
<td>Melting Temperature</td>
<td>Varies</td>
</tr>
<tr>
<td>Freezing Temperature</td>
<td>Varies</td>
</tr>
<tr>
<td>Initial Boiling Point</td>
<td>NA</td>
</tr>
<tr>
<td>Boiling Range</td>
<td>NA</td>
</tr>
<tr>
<td>Flash Point</td>
<td>NA</td>
</tr>
<tr>
<td>Evaporation rate</td>
<td>NA</td>
</tr>
<tr>
<td>Flammability (solid)</td>
<td>NE</td>
</tr>
<tr>
<td>Upper/Lower Flammability</td>
<td>NE</td>
</tr>
<tr>
<td>Upper/Lower Explosive Limits</td>
<td>NE</td>
</tr>
<tr>
<td>Vapor pressure (mmHg)</td>
<td>NA</td>
</tr>
<tr>
<td>Vapor density (Air = 1)</td>
<td>NA</td>
</tr>
<tr>
<td>Relative density</td>
<td>NE</td>
</tr>
<tr>
<td>Solubility in water</td>
<td>Insoluble</td>
</tr>
<tr>
<td>Partition coefficient (n-octanol/water)</td>
<td>NE</td>
</tr>
<tr>
<td>Autoignition Temperature</td>
<td>NE</td>
</tr>
<tr>
<td>Decomposition Temperature</td>
<td>NE</td>
</tr>
<tr>
<td>Viscosity</td>
<td>NA</td>
</tr>
</tbody>
</table>

Note from Section 9: Other physical and chemical properties depend on alloy composition.

SECTION 10: STABILITY AND REACTIVITY

<table>
<thead>
<tr>
<th>Property</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stability</td>
<td>Stable</td>
</tr>
<tr>
<td>Conditions to Avoid (Stability)</td>
<td>NE</td>
</tr>
</tbody>
</table>
Incompatibility (Material to avoid): Oxidizing materials, acids, hydrogen peroxide, bases

Hazardous Decomposition/By-Products: Harmful organic fumes and toxic oxide fumes may form at elevated temperatures.

Possibility of Hazardous Reactions: NE

SECTION 11: TOXICOLOGICAL INFORMATION

Inhalation: This product does not present a risk at ambient temperatures. The flux fumes evolved during soldering will irritate the nose, throat and lungs. Repeated or prolonged exposure to flux fumes may cause an allergic effect which may lead to occupational asthma.

Skin: Contact with flux fumes and flux residues may cause irritation and sensitization.

Eyes: Contact with flux fumes and flux residues may cause irritation and sensitization.

Health Hazards (acute and chronic): Contact with dust and fumes may cause skin, eye and respiratory irritation. Ingestion and/or inhalation of material or fumes may result in flu-like symptoms, insomnia, muscle weakness, nausea and abdominal pain. Fross inhalation or ingestion may be toxic and can result in death. Symptoms of toxicity may take hours or days to manifest. Chronic exposures, inhalation and ingestion may result in kidney, red blood cell, reproductive and nervous system effects. Health effects may be cumulative over many exposures. Studies show that health risks vary by individual. Minimize exposure as a precaution. See OSHA 29CFR 1910.1025(subpart Z) for more information.

Acute toxicity:

<table>
<thead>
<tr>
<th>Product/Ingredient Name</th>
<th>Result</th>
<th>Species</th>
<th>Dose</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rosin:</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>7600 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Terpineol</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>2000 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>LD50 Inhalation</td>
<td>Rat</td>
<td>4.76 mg/l</td>
<td>4 hours</td>
</tr>
<tr>
<td></td>
<td>LD50 Dermal</td>
<td>Rat</td>
<td>2000 mg/kg</td>
<td>-</td>
</tr>
<tr>
<td>Maleic acid</td>
<td>LD50 Oral</td>
<td>Rat</td>
<td>7089 mg/kg</td>
<td>Remarks: Behavioral: Convulsions or effect on seizure threshold. Behavioural: Muscle weakness. Gastrointestinal: Ulceration or bleeding from stomach.</td>
</tr>
<tr>
<td></td>
<td>LD50 Inhalation</td>
<td>Rat</td>
<td>720 mg/m³</td>
<td>1 hour</td>
</tr>
<tr>
<td>Antimony</td>
<td>LD50 Dermal</td>
<td>Rabbit</td>
<td>1560 mg/kg</td>
<td>Remarks: Behavioural: Tremor</td>
</tr>
<tr>
<td>Silver</td>
<td>LD50 Oral</td>
<td>Mouse</td>
<td>100 mg/kg</td>
<td></td>
</tr>
</tbody>
</table>

Skin Corrosion/Irritation: NE

Serious Eye Damage/Irritation: NA

Respiratory or skin sensitization: NE

Germ Cell Mutagenicity: NA

Carcinogenicity: OSHA: NA ACGIH: NA NTP: NA IARC: NA

Reproductive toxicity: NA
STOT-Single Exposure:

<table>
<thead>
<tr>
<th>Product/Ingredient Name</th>
<th>Category</th>
<th>Route of Exposure</th>
<th>Target Organs</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maleic Acid</td>
<td>Category 3</td>
<td>Not applicable</td>
<td>Respiratory Trace irritation</td>
</tr>
</tbody>
</table>

STOT-Repeated Exposure: NA

Aspiration Hazard: NA

Section 11 Notes: This product has not been tested as a whole to determine its hazards. Synergistic or additive effects of the above chemicals are unknown, as are the effects of exposure to these chemicals in addition to others present in the work place. See Section 2 for additional health hazards.

SECTION 12: ECOLOGICAL INFORMATION

<table>
<thead>
<tr>
<th>Product/Ingredient Name</th>
<th>Result</th>
<th>Species</th>
<th>Exposure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Silver</td>
<td>Acute EC50 1.5 µg/l Marine water</td>
<td>Algae – Chroomonas sp.</td>
<td>4 days</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 0.24 µg/l Fresh water</td>
<td>Daphnia – Daphnia magna</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 11.5 µg/l Fresh water</td>
<td>Crustaceans – Ceriodaphnia reticulata</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 2.13 µg/l Fresh water</td>
<td>Fish – Pimephales promelas</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 5 mg/l Marine water</td>
<td>Algae – Glenodinium halli</td>
<td>72 hours</td>
</tr>
<tr>
<td>Rosin</td>
<td>Acute LC50 60.3 mg/l Fresh water</td>
<td>Brachydanio rerio (zebra fish)</td>
<td>96 hours</td>
</tr>
<tr>
<td>Terpineol</td>
<td>Acute LC50 62.80 mg/l Fresh water</td>
<td>Danio rerio (zebra fish)</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 68 mg/l Marine water</td>
<td>Algae – Pseudokirchneriella subcapitata (green algae)</td>
<td>72 hours</td>
</tr>
<tr>
<td>Maleic Acid</td>
<td>Acute EC50 316200 µg/l Fresh water</td>
<td>Daphnia – Daphnia magna – Larvae</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 5000 µg/l Fresh water</td>
<td>Fish – Pimephales promelas</td>
<td>96 hours</td>
</tr>
<tr>
<td>Copper</td>
<td>Acute EC50 1100 µg/l Fresh water</td>
<td>Aquatic plants - Lemna minor</td>
<td>4 days</td>
</tr>
<tr>
<td></td>
<td>Acute EC50 2.1 µg/l Fresh water</td>
<td>Daphnia – Daphnia longispina – Juvenile (Fledgling, Hatchling, Weanling)</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute IC50 13 µg/l Fresh water</td>
<td>Algae – Pseudokirchneriella subcapitata – Exponential growth phase</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute IC50 5.4 mg/l Marine water</td>
<td>Aquatic plants – Plantae – Exponential growth phase</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 0.072 µg/l Marine water</td>
<td>Crustaceans – Amphipoda – Adult</td>
<td>48 hours</td>
</tr>
<tr>
<td></td>
<td>Acute LC50 7.56 µg/l Marine water</td>
<td>Fish – Periophthalmus waltoni – Adult</td>
<td>96 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 2.5 µg/l Marine water</td>
<td>Algae – Nitzschia closterium – Exponential growth phase</td>
<td>72 hours</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 7 mg/l Fresh water</td>
<td>Aquatic plants – Ceratophyllum demersum</td>
<td>3 days</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 0.02 mg/l Fresh water</td>
<td>Crustaceans – Cambarus bartonii – Mature</td>
<td>21 days</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 2 µg/l Fresh water</td>
<td>Daphnia – Daphnia magna</td>
<td>21 days</td>
</tr>
<tr>
<td></td>
<td>Chronic NOEC 0.8 µg/l Fresh water</td>
<td>Fish – Oreochromis niloticus – Juvenile (Fledgling, Hatchling, Weanling)</td>
<td>6 weeks</td>
</tr>
</tbody>
</table>

Persistence and Degradability: NE

Bioaccumulative Potential:
SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: Scrap and waste should be recycled or stored in a dry, sealed container for later disposal. Disposal must be in accordance with Federal, State/Provincial and Local Regulations.

Other precautions: Avoid skin & eye contact, inhalation & ingestion of fumes and material. Wash contaminated clothing before reuse. Keep away from children.

SECTION 14: TRANSPORT INFORMATION

UN number: Not available
UN Proper shipping name: Not available
Packaging Group: Not applicable
Environmental Hazards: None

TRANSPORT HAZARD CLASSES:
US DOT Hazardous Material Classification: Non-Hazardous
Water Transportation: Non-Hazardous
IATA Hazardous Material Classification: Non-Hazardous
ADR Road Regulations: Not regulated
IMDG Sea Regulations: Not regulated
ADG Land Transportation: Not regulated

SECTION 15: REGULATORY INFORMATION

All ingredients used to manufacture this product are listed on the EPA TSCA Inventory. Finished product is not listed on the EPA TSCA Inventory.

US Federal Regulations: Not regulated
State Regulations: Not regulated
International Regulations: Not regulated
Australian Regulations: Not regulated

SECTION 16: ADDITIONAL INFORMATION

Legend:

ACGIH: American Conference Of Governmental Industrial Hygienists
ADG: Australian Dangerous Goods Code
ADR: European Agreement Concerning The International Carriage Of Dangerous Goods By Road
AICS: Australian Inventory Of Chemical Substances
BCF: Bioconcentration Factor
C.A.S: Chemical Abstract Service
CLP: Classification, Labeling And Packaging
DOT: Department Of Transportation
EC: Effective Concentration
EPA: Environmental Protection Agency
GHS: Global Harmonized System
SAFETY DATA SHEET

Lead-Free Solder Paste (SnBiAg)

First issue: 2018-07-30
Revision date: 2018-07-30
Version: 1.0

HMIS Hazardous Material Identification System
IARC International Agency For Research On Cancer
IATA International Air Transport Association
IMDG International Maritime Dangerous Goods Code
LC Lethal Concentration
LD Lethal Dose
NA Not Available
NE Not Established
NIOSH National Institute For Occupational Safety & Health
NOEC No Observed Effective Concentration
NOHSC National Occupational Health And Safety Commission (Australia)
NTP National Toxicology Program
OSHA Occupational Safety And Health Administration
PEL Permissible Exposure Limit
P<sub>ow</sub> Octanol Water Partition Coefficient
SDS Safety Data Sheet
STEL Short-Term Exposure Limit
STOT Specific Target Organ Toxicity
TLV Threshold Limit Value
TSCA Toxic Substance Control Act
TWA Time Weighted Average
US DOT United States Department Of Transportation

Disclaimer:
The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Additionally, Voltera Inc. assumes no responsibility for injury to the end user proximately caused by the material even if reasonable safety procedures are followed. The end user assumes the risk in their use of this material.