

Safety Data Sheet

Conductive Silver Pen

1. Product and company identification

Product name	Conductive Silver Pen
Supplier	Ladd Research 3 Ewing Place Wessex Junction, VT 05452 USA Tel. 802-658-4961 Fax: 802-660-8859
Synonym	Silver Conductive Ink
Trade name	Circuitworks® Conductive Pen
Material uses	Electrical conductive agents
Manufacturer	Chemtronics 8125 Cobb Center Drive Kennesaw, GA 30152 Tel. 770-424-4888 or toll free 800-645-5244
Catalog Number	60803
Preparation date	06/23/2023
In case of emergency	Chemtrec - 1-800-424-9300 or collect 703-527-3887 (24/7/365)
Product type	Electric and electromechanical components - Conductive materials

2. Hazards identification

Emergency overview

Physical state	: Liquid.
Color	: Gray.
Signal word	: WARNING!
Hazard statements	: FLAMMABLE LIQUID AND VAPOR. HARMFUL IF INHALED. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.
Precautionary measures	: Do not breathe vapor or mist. Use only with adequate ventilation. Do not eat, drink or smoke when using this product. Avoid contact with eyes, skin and clothing. Avoid prolonged contact with eyes, skin and clothing. Keep away from heat, sparks and flame. Keep container tightly closed. Wash thoroughly after handling.
OSHA/HCS status	: This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Potential acute health effects

Inhalation	: Toxic by inhalation.
Ingestion	: Harmful if swallowed.
Skin	: Harmful in contact with skin. Moderately irritating to the skin.
Eyes	: Moderately irritating to eyes.

Potential chronic health effects

Chronic effects	: Contains material that can cause target organ damage.
Carcinogenicity	: No known significant effects or critical hazards.
Mutagenicity	: No known significant effects or critical hazards.
Teratogenicity	: No known significant effects or critical hazards.

2. Hazards identification

- Developmental effects** : No known significant effects or critical hazards.
- Fertility effects** : No known significant effects or critical hazards.
- Target organs** : Contains material which causes damage to the following organs: eye, lens or cornea.
Contains material which may cause damage to the following organs: blood, kidneys, liver, mucous membranes, spleen, lymphatic system, upper respiratory tract, skin, bone marrow, central nervous system (CNS), nose/sinuses, testes.

Over-exposure signs/symptoms

- Inhalation** : Adverse symptoms may include the following:
headache
nausea or vomiting
dizziness/vertigo
drowsiness/fatigue
respiratory tract irritation
unconsciousness
- Ingestion** : Adverse symptoms may include the following:
central nervous system depression
- Skin** : Adverse symptoms may include the following:
irritation
redness
- Eyes** : Adverse symptoms may include the following:
irritation
watering
redness
- Medical conditions aggravated by over-exposure** : Repeated exposure may cause skin dryness or cracking.

See toxicological information (Section 11)

3. Composition/information on ingredients

Name	CAS number	%
silver	7440-22-4	35 - 65
n-butyl acetate	123-86-4	5 - 35
2-methoxy-1-methylethyl acetate	108-65-6	2 - 20
2-butoxyethyl acetate	112-07-2	2 - 20

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

4. First aid measures

- Eye contact** : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.
- Skin contact** : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.
- Inhalation** : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.
- Ingestion** : Wash out mouth with water. Do not induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Get medical attention immediately.

4. First aid measures

- Protection of first-aiders** : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.
- Notes to physician** : No specific treatment. Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

5. Fire-fighting measures

- Flammability of the product** : Flammable liquid. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. Runoff to sewer may create fire or explosion hazard.

Extinguishing media

- Suitable** : Use dry chemical, CO₂, water spray (fog) or foam.
- Not suitable** : Do not use water jet.
- Special exposure hazards** : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.
- Hazardous thermal decomposition products** : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
metal oxide/oxides
- Special protective equipment for fire-fighters** : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

6. Accidental release measures

- Personal precautions** : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Do not breathe vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment (see Section 8).
- Environmental precautions** : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).
- Methods for cleaning up**
- Small spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.
- Large spill** : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

7. Handling and storage

Handling

- : Put on appropriate personal protective equipment (see Section 8). Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use non-sparking tools. Take precautionary measures against electrostatic discharges. To avoid fire or explosion, dissipate static electricity during transfer by grounding and bonding containers and equipment before transferring material. Empty containers retain product residue and can be hazardous. Do not reuse container.

Storage

- : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

8. Exposure controls/personal protection

Ingredient	Exposure limits
silver	ACGIH TLV (United States, 3/2012). TWA: 0.1 mg/m ³ 8 hours. Form: Dust and fumes NIOSH REL (United States, 1/2013). Notes: as Ag TWA: 0.01 mg/m ³ , (as Ag) 10 hours. Form: METAL DUST AND SOLUBLE OSHA PEL (United States, 6/2010). Notes: as Ag TWA: 0.01 mg/m ³ , (as Ag) 8 hours. OSHA PEL 1989 (United States, 3/1989). Notes: as Ag TWA: 0.01 mg/m ³ , (as Ag) 8 hours.
n-butyl acetate	ACGIH TLV (United States, 3/2012). STEL: 200 ppm 15 minutes. TWA: 150 ppm 8 hours. NIOSH REL (United States, 1/2013). STEL: 950 mg/m ³ 15 minutes. STEL: 200 ppm 15 minutes. TWA: 710 mg/m ³ 10 hours. TWA: 150 ppm 10 hours. OSHA PEL (United States, 6/2010). TWA: 710 mg/m ³ 8 hours. TWA: 150 ppm 8 hours. OSHA PEL 1989 (United States, 3/1989). STEL: 950 mg/m ³ 15 minutes. STEL: 200 ppm 15 minutes. TWA: 710 mg/m ³ 8 hours. TWA: 150 ppm 8 hours.
2-methoxy-1-methylethyl acetate	AIHA WEEL (United States, 10/2011). TWA: 50 ppm 8 hours.
2-butoxyethyl acetate	ACGIH TLV (United States, 3/2012). TWA: 20 ppm 8 hours. NIOSH REL (United States, 1/2013). TWA: 33 mg/m ³ 10 hours.

8. Exposure controls/personal protection

TWA: 5 ppm 10 hours.

Recommended monitoring procedures	: If this product contains ingredients with exposure limits, personal, workplace atmosphere or biological monitoring may be required to determine the effectiveness of the ventilation or other control measures and/or the necessity to use respiratory protective equipment. Reference should be made to appropriate monitoring standards. Reference to national guidance documents for methods for the determination of hazardous substances will also be required.
Engineering measures	: Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.
Hygiene measures	: Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.
<u>Personal protection</u>	
Respiratory	: Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.
Hands	: Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.
Eyes	: Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.
Skin	: Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.
Environmental exposure controls	: Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

9. Physical and chemical properties

Physical state	: Liquid.
Flash point	: Closed cup: 24°C (75.2°F) [Tagliabue.]
Color	: Gray.
Boiling/condensation point	: 126°C (258.8°F)
Relative density	: 2
Vapor pressure	: 0.67 kPa (5 mm Hg) [room temperature]
Volatility	: 35% (v/v)
Evaporation rate	: >1 (butyl acetate = 1)

9. Physical and chemical properties

Dispersibility properties : Not dispersible in the following materials: cold water, hot water, methanol, diethyl ether, n-octanol and acetone.

10. Stability and reactivity

Chemical stability : The product is stable.

Conditions to avoid : Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition.

Incompatible materials : Reactive or incompatible with the following materials:
oxidizing materials acids alkalis

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Possibility of hazardous reactions : Under normal conditions of storage and use, hazardous reactions will not occur.

11. Toxicological information

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
n-butyl acetate	LC50 Inhalation Gas. LD50 Dermal LD50 Oral	Rat Rabbit Rat	390 ppm >17600 mg/kg 10768 mg/kg	4 hours - -
2-methoxy-1-methylethyl acetate	LD50 Dermal	Rabbit	>5 g/kg	-
2-butoxyethyl acetate	LD50 Oral LD50 Dermal LD50 Oral	Rat Rabbit Rat	8532 mg/kg 1500 mg/kg 2400 mg/kg	- - -

Conclusion/Summary : Not available.

Chronic toxicity

Conclusion/Summary : Not available.

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
n-butyl acetate	Eyes - Moderate irritant	Rabbit	-	100 milligrams	-
	Skin - Moderate irritant	Rabbit	-	24 hours 500 milligrams	-
2-butoxyethyl acetate	Eyes - Mild irritant	Rabbit	-	24 hours 500 milligrams	-
	Skin - Mild irritant	Rabbit	-	500 milligrams	-

Conclusion/Summary : Not available.

Sensitizer

Conclusion/Summary : Not available.

Carcinogenicity

Conclusion/Summary : Not available.

Classification

11. Toxicological information

Product/ingredient name	OSHA	IARC	NTP	ACGIH	EPA	NIOSH
silver	-	-	-	-	-	None.
n-butyl acetate	-	-	-	A4	-	None.
2-methoxy-1-methylethyl acetate	-	-	-	-	-	None.
2-butoxyethyl acetate	-	-	-	A3	-	None.

Mutagenicity

Conclusion/Summary : Not available.

Teratogenicity

Conclusion/Summary : Not available.

Reproductive toxicity

Conclusion/Summary : Not available.

12. Ecological information

Ecotoxicity : No known significant effects or critical hazards.

Aquatic ecotoxicity

Product/ingredient name	Result	Species	Exposure
silver	Acute EC50 1.4 µg/l Marine water Acute EC50 0.24 µg/l Fresh water Acute LC50 4500 ppb Fresh water	Algae - Chroomonas sp. Daphnia - Daphnia magna Crustaceans - Gammarus pseudolimnaeus	4 days 48 hours 48 hours
	Acute LC50 2.13 to 2.93 µg/l Fresh water	Fish - Pimephales promelas	96 hours
n-butyl acetate	Chronic NOEC 5 mg/l Marine water Acute LC50 32000 µg/l Marine water	Algae - Glenodinium halli Crustaceans - Artemia salina - Nauplii	72 hours 48 hours
	Acute LC50 62000 µg/l	Fish - Danio rerio	96 hours

Conclusion/Summary : Not available.

Persistence/degradability

Conclusion/Summary : Not available.

Other adverse effects : No known significant effects or critical hazards.




13. Disposal considerations

Waste disposal : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Disposal should be in accordance with applicable regional, national and local laws and regulations.

Refer to Section 7: HANDLING AND STORAGE and Section 8: EXPOSURE CONTROLS/PERSONAL PROTECTION for additional handling information and protection of employees.

14. Transport information

Regulatory information	UN number	Proper shipping name	Classes	PG*	Label	Additional information
DOT Classification	-	Consumer commodity ORM-D	ORM-D	-		Reportable quantity 2000 lbs / 908 kg [119.93 gal / 454 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.
TDG Classification	-	Consumer commodity ORM-D	ORM-D	-		-
Mexico Classification	-	Consumer commodity ORM-D	ORM-D	-		-
ADR/RID Class	1263	Paint	3	III		Limited quantity
IMDG Class	1263	Paint	3	III		Limited quantity
IATA-DGR Class	1263	Paint	3	III		Limited quantity

PG* : Packing group

15. Regulatory information

- HCS Classification** : Flammable liquid
Toxic material
Irritating material
Target organ effects
- U.S. Federal regulations** : **TSCA 8(a) PAIR**: 2-methoxy-1-methylethyl acetate
TSCA 8(a) CDR Exempt/Partial exemption: Not determined
United States inventory (TSCA 8b): Not determined.
Clean Water Act (CWA) 307: silver
Clean Water Act (CWA) 311: n-butyl acetate
- Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs)** : Listed
- Clean Air Act Section 602 Class I Substances** : Not listed
- Clean Air Act Section 602 Class II Substances** : Not listed
- DEA List I Chemicals (Precursor Chemicals)** : Not listed

15. Regulatory information

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
silver	35 - 65	No.	No.	No.	No.	Yes.
n-butyl acetate	5 - 35	Yes.	No.	No.	Yes.	Yes.
2-methoxy-1-methylethyl acetate	2 - 20	Yes.	No.	No.	No.	Yes.
2-butoxyethyl acetate	2 - 20	Yes.	No.	No.	No.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	silver 2-butoxyethyl acetate	7440-22-4 112-07-2	35 - 65 2 - 20
Supplier notification	silver 2-butoxyethyl acetate	7440-22-4 112-07-2	35 - 65 2 - 20

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations

Massachusetts : The following components are listed: SILVER; BUTYL ACETATE
New York : The following components are listed: Silver; Butyl acetate
New Jersey : The following components are listed: SILVER; n-BUTYL ACETATE; ACETIC ACID, BUTYL ESTER; 2-BUTOXYETHYL ACETATE; ETHANOL, 2-BUTOXY-, ACETATE
Pennsylvania : The following components are listed: SILVER; ACETIC ACID, BUTYL ESTER; GLYCOL ETHERS
Canada inventory : Not determined.

International regulations

International lists

: **Australia inventory (AICS)**: Not determined.
China inventory (IECSC): Not determined.
Japan inventory: Not determined.
Korea inventory: Not determined.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): Not determined.
Philippines inventory (PICCS): Not determined.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

15. Regulatory information

Chemical Weapons : Not listed
 Convention List Schedule
 II Chemicals

Chemical Weapons : Not listed
 Convention List Schedule
 III Chemicals

16. Other information

Label requirements : FLAMMABLE LIQUID AND VAPOR. HARMFUL IF INHALED. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. MAY CAUSE EYE AND SKIN IRRITATION. CONTAINS MATERIAL THAT CAN CAUSE TARGET ORGAN DAMAGE.

**Hazardous Material
 Information System (U.S.A.)** :

Health	2
Flammability	3
Physical hazards	1

Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks. Although HMIS® ratings are not required on MSDSs under 29 CFR 1910.1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

**National Fire Protection
 Association (U.S.A.)** :



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Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

Date of issue 06/23/2023

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