

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

1 Identification

- **Product identifier**
- **Trade name:** AG-1074 Silver Conductive Ink
- **Application of the substance / the mixture** Silver electronic printing ink
- **Details of the supplier of the safety data sheet**
- **Manufacturer/Supplier:**
 Kayaku Advanced Materials, Inc.
 200 Flanders Road
 Westborough, MA 01581
 Tel: (617) 965-5511
 Fax: (617) 965-5818
- **Information department:**
 Product Safety
 Email: productsafety@kayakuAM.com
- **Emergency telephone number:**
 Kayaku Advanced Materials : 617-965-5511
 Chemtrec USA Emergency : 800-424-9300
 Chemtrec International Emergency : 703-527-3887

2 Hazard(s) identification

- **Classification of the substance or mixture**



GHS02 Flame

Flammable Liquids 3

H226 Flammable liquid and vapor.



GHS09 Environment

Aquatic Acute 1

H400 Very toxic to aquatic life.

Aquatic Chronic 1

H410 Very toxic to aquatic life with long lasting effects.



GHS07

Specific Target Organ Toxicity - Single Exposure 3 H336 May cause drowsiness or dizziness.

- **Label elements**
- **GHS label elements** The product is classified and labeled according to the Globally Harmonized System (GHS).
- **Hazard pictograms**



GHS02



GHS07



GHS09

- **Signal word** Warning
- **Hazard-determining components of labeling:**
 n-Butyl acetate
 gamma-Butyrolactone

(Contd. on page 2)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 1)

Hazard statements

- H226 Flammable liquid and vapor.
 H336 May cause drowsiness or dizziness.
 H400 Very toxic to aquatic life.
 H410 Very toxic to aquatic life with long lasting effects.

Precautionary statements

- P210 Keep away from heat/sparks/open flames/hot surfaces. - No smoking.
 P261 Avoid breathing dust/fume/gas/mist/vapors/spray
 P273 Avoid release to the environment.
 P280 Wear protective gloves/protective clothing/eye protection/face protection.
 P301+P310 If swallowed: Immediately call a poison center/doctor.
 P302+P352 If on skin: Wash with plenty of soap and water.
 P304+P341 If inhaled: If breathing is difficult, remove person to fresh air and keep comfortable for breathing.
 P305+P351+P338 If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
 P333+P313 If skin irritation or rash occurs: Get medical advice/attention.
 P337+P313 If eye irritation persists: Get medical advice/attention.
 P370+P378 In case of fire: Use to extinguish: Alcohol resistant foam, Fire-extinguishing powder, Carbon dioxide.
 P403+P233 Store in a well-ventilated place. Keep container tightly closed.
 P501 Dispose of contents/container in accordance with local/regional/national/international regulations.

Classification system:
NFPA ratings (scale 0 - 4)

HMIS-ratings (scale 0 - 4)

Other hazards
Results of PBT and vPvB assessment

- **PBT:** Not applicable.
 · **vPvB:** Not applicable.

3 Composition/information on ingredients

Chemical characterization: Mixtures

· **Description:** Mixture of the substances listed below with nonhazardous additions.

Dangerous components:

| | | |
|-----------|---|--------|
| 7440-22-4 | Silver | 40-60% |
| | ⚠ Aquatic Acute 1, H400; Aquatic Chronic 1, H410 | |
| 123-86-4 | n-Butyl acetate | 25-50% |
| | ⚠ Flammable Liquids 3, H226; ⚠ Specific Target Organ Toxicity - Single Exposure 3, H336 | |

(Contd. on page 3)

Safety Data Sheet



acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 2)

| | | |
|-------------------------------|---|-------|
| 96-48-0 | gamma-Butyrolactone | 5-15% |
| |  Eye Damage 1, H318;  Acute Toxicity - Oral 4, H302; Specific Target Organ Toxicity - Single Exposure 3, H336 | |
| Additional Components: | | |
| | Proprietary polyester | 5-15% |

4 First-aid measures

- **Description of first aid measures**
- **General information:** Immediately remove any clothing soiled by the product.
- **After inhalation:**
Supply fresh air. If required, provide artificial respiration. Keep patient warm. Consult doctor if symptoms persist.
- **After skin contact:** Immediately wash with water and soap and rinse thoroughly.
- **After eye contact:**
Wash eyes immediately with a large amount of water or normal saline, occasionally lifting upper and lower eye lids until no evidence of chemical remains (about 20 minutes). Remove contact lenses if present and easy to remove. Seek immediate medical attention.
- **After swallowing:**
Do not induce vomiting unless instructed to do so by a physician. Wash out mouth with water and keep person at rest. Seek immediate medical attention.
- **Information for doctor:**
- **Most important symptoms and effects, both acute and delayed** No further relevant information available.
- **Indication of any immediate medical attention and special treatment needed** Treat symptomatically.

5 Fire-fighting measures

- **Extinguishing media**
- **Suitable extinguishing agents:**
Alcohol resistant foam
Fire-extinguishing powder
ABC powder
- **For safety reasons unsuitable extinguishing agents:** Water with full jet
- **Special hazards arising from the substance or mixture** No further relevant information available.
- **Advice for firefighters**
- **Protective equipment:** Wear SCBA.

6 Accidental release measures

- **Personal precautions, protective equipment and emergency procedures**
Wear protective equipment. Keep unprotected persons away.
Ensure adequate ventilation
Keep away from ignition sources
- **Environmental precautions:** Do not allow to enter sewers/ surface or ground water.
- **Methods and material for containment and cleaning up:**
Absorb with liquid-binding material (sand, diatomite, acid binders, universal binders, sawdust).
Do not flush with water or aqueous cleansing agents

(Contd. on page 4)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 3)

- **Reference to other sections**
 See Section 7 for information on safe handling.
 See Section 8 for information on personal protection equipment.
 See Section 13 for disposal information.
- **Protective Action Criteria for Chemicals**

· PAC-1:

| | | |
|-----------|---------------------|-----------------------|
| 7440-22-4 | Silver | 0.3 mg/m ³ |
| 123-86-4 | n-Butyl acetate | 5 ppm |
| 96-48-0 | gamma-Butyrolactone | 3.6 mg/m ³ |

· PAC-2:

| | | |
|-----------|---------------------|-----------------------|
| 7440-22-4 | Silver | 170 mg/m ³ |
| 123-86-4 | n-Butyl acetate | 200 ppm |
| 96-48-0 | gamma-Butyrolactone | 39 mg/m ³ |

· PAC-3:

| | | |
|-----------|---------------------|-----------------------|
| 7440-22-4 | Silver | 990 mg/m ³ |
| 123-86-4 | n-Butyl acetate | 3000* ppm |
| 96-48-0 | gamma-Butyrolactone | 310 mg/m ³ |

7 Handling and storage

- **Handling:**
- **Precautions for safe handling**
 Ensure good ventilation/exhaust at the workplace.
 Prevent formation of aerosols.
- **Information about protection against explosions and fires:**
 Keep ignition sources away - Do not smoke.
 Protect against electrostatic charges.
 Use explosion-proof apparatus / fittings and spark-proof tools.
- **Conditions for safe storage, including any incompatibilities**
- **Storage:**
- **Requirements to be met by storerooms and containers:** No special requirements.
- **Information about storage in one common storage facility:**
 Do not store together with alkalis (caustic solutions).
 Do not store together with oxidizing and acidic materials.
- **Further information about storage conditions:**
 Keep container well-sealed in cool, dry location.
 Protect from heat and direct sunlight.
 Store receptacle in a well ventilated area.
- **Specific end use(s)** No further relevant information available.

8 Exposure controls/personal protection

- **Additional information about design of technical systems:** No further data; see item 7.

(Contd. on page 5)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 4)

· **Control parameters**

· **Components with limit values that require monitoring at the workplace:**

The following constituent is the only constituent of the product which has a PEL, TLV or other recommended exposure limit.

At this time, the other constituents have no known exposure limits.

123-86-4 n-Butyl acetate

PEL Long-term value: 710 mg/m³, 150 ppm

REL Short-term value: 950 mg/m³, 200 ppm

Long-term value: 710 mg/m³, 150 ppm

TLV Short-term value: 712 mg/m³, 150 ppm

Long-term value: 238 mg/m³, 50 ppm

· **Additional information:** The lists that were valid during the creation were used as basis.

· **Exposure controls**

· **Personal protective equipment:**

· **General protective and hygienic measures:** Wash hands before breaks and at the end of work.

· **Respiratory equipment:** Not required.

· **Protection of hands:**



Protective gloves

The glove material has to be impermeable and resistant to the product/ the substance/ the preparation.

· **Material of gloves:** Nitrile rubber, NBR

· **Penetration time of glove material:** Contact glove manufacture for break-through time.

· **Eye protection:**



Tightly sealed goggles

9 Physical and chemical properties

· **Information on basic physical and chemical properties**

· **General Information**

· **Appearance:**

Form: Liquid

Color: Silver/brown

· **Odor:** Sweet

· **Odor threshold:** Not determined.

· **pH-value:** Not determined.

· **Change in condition**

Melting point/Melting range: Undetermined.

Boiling point/Boiling range: 124 °C (255.2 °F)

· **Flash point:** 27 °C (80.6 °F)

(Contd. on page 6)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 5)

| | |
|---|--|
| · Flammability (solid, gaseous): | Not applicable. |
| · Ignition temperature: | 370 °C (698 °F) |
| · Decomposition temperature: | Not determined. |
| · Auto igniting: | Product is not selfigniting. |
| · Danger of explosion: | Product is not explosive. However, formation of explosive air/vapor mixtures are possible. |
| · Explosion limits: | |
| Lower: | 1.2 Vol % |
| Upper: | 7.5 Vol % |
| · Vapor pressure at 20 °C (68 °F): | 10.7 hPa (8 mm Hg) |
| · Density at 20 °C (68 °F): | 5.84696 g/cm ³ (48.79288 lbs/gal) |
| · Relative density | Not determined. |
| · Vapor density | Not determined. |
| · Evaporation rate | 1.6-2.3 (BuAc=1) |
| · Solubility in / Miscibility with Water: | Water miscible No |
| · Partition coefficient (n-octanol/water): | Not determined. |
| · Viscosity: | |
| Dynamic: | Not determined. |
| Kinematic: | Not determined. |
| · Solvent content: | |
| Organic solvents: | 25-50 % |
| VOC content: | 25-50 % |
| · Solids content: | 58-62 % |
| · Other information | No further relevant information available. |

10 Stability and reactivity

- **Reactivity** No further relevant information available.
- **Chemical stability** Stable
- **Thermal decomposition / conditions to be avoided:** No decomposition if used according to specifications.
- **Possibility of hazardous reactions** No dangerous reactions known.
- **Conditions to avoid**
Heat, flames and sparks. Extremes of temperature and direct sunlight.
Contact with incompatible materials.
- **Incompatible materials:** Strong Oxidizing Agents, Strong Acids, Strong Bases
- **Hazardous decomposition products:** Carbon monoxide and carbon dioxide

US

(Contd. on page 7)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 6)

11 Toxicological information

- **Information on toxicological effects**
- **Acute toxicity:**
- **Primary irritant effect:**
- **on the skin:** No irritant effect.
- **on the eye:** No irritating effect.
- **Sensitization:** No sensitizing effects known.
- **Additional toxicological information:**
- **Carcinogenic categories**

 · **IARC (International Agency for Research on Cancer)**

96-48-0 gamma-Butyrolactone

3

 · **NTP (National Toxicology Program)**

None of the ingredients are listed.

 · **OSHA-Ca (Occupational Safety & Health Administration)**

None of the ingredients are listed.

12 Ecological information

- **Toxicity**
- **Aquatic toxicity:** No further relevant information available.
- **Persistence and degradability** No further relevant information available.
- **Behavior in environmental systems:**
- **Bioaccumulative potential** No further relevant information available.
- **Mobility in soil** No further relevant information available.
- **Additional ecological information:**
- **General notes:**
- Water hazard class 2 (Self-assessment): hazardous for water
- Do not allow product to reach ground water, water course or sewage system.
- Danger to drinking water if even small quantities leak into the ground.
- **Results of PBT and vPvB assessment**
- **PBT:** Not applicable.
- **vPvB:** Not applicable.
- **Other adverse effects** No further relevant information available.

13 Disposal considerations

- **Waste treatment methods**
- **Recommendation:**
- Must not be disposed of as regular garbage/trash. Do not allow product to reach sewage system.
- Disposal must be made in accordance with Federal, State, and Local regulations.
- **Uncleaned packagings:**
- **Recommendation:** Disposal must be made in accordance with Federal, State, and Local regulations.

US

(Contd. on page 8)

Safety Data Sheet

acc. to OSHA HCS



Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 7)

14 Transport information

| | |
|--|--|
| · UN-Number | UN1210 |
| · DOT, ADR, IMDG, IATA | |
| · UN proper shipping name | Printing ink |
| · DOT, ADR | PRINTING INK, MARINE POLLUTANT |
| · IMDG | PRINTING INK |
| · IATA | |
| · Transport hazard class(es) | |
| · DOT | |
|  | |
| · Class | 3 Flammable liquids |
| · Label | 3 |
| · ADR, IMDG, IATA | |
|  | |
| · Class | 3 Flammable liquids |
| · Label | 3 |
| · Packing group | |
| · DOT, ADR, IMDG, IATA | III |
| · Environmental hazards: | Not applicable. |
| · Marine pollutant: | Yes (DOT) |
| · Special precautions for user | Warning: Flammable liquids |
| · Hazard identification number (Kemler code): | 30 |
| · EMS Number: | F-E,S-D |
| · Stowage Category | A |
| · Transport in bulk according to Annex II of MARPOL73/78 and the IBC Code | Not applicable. |
| · Transport/Additional information: | |
| · DOT | |
| · Quantity limitations | On passenger aircraft/rail: 60 L On cargo aircraft only: 220 L |
| · ADR | |
| · Excepted quantities (EQ) | Code: E1 Maximum net quantity per inner packaging: 30 ml Maximum net quantity per outer packaging: 1000 ml |
| · IMDG | |
| · Limited quantities (LQ) | 5L |

(Contd. on page 9)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 8)

 · **Excepted quantities (EQ)**

Code: E1

Maximum net quantity per inner packaging: 30 ml

Maximum net quantity per outer packaging: 1000 ml

 · **UN "Model Regulation":**

UN 1210 PRINTING INK, 3, III

15 Regulatory information

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

 · **Sara**

 · **Section 355 (extremely hazardous substances):**

None of the ingredients are listed.

 · **Section 313 (Specific toxic chemical listings):**

7440-22-4 Silver

 · **TSCA (Toxic Substances Control Act):** All ingredients are listed or comply with TSCA regulations.

 · **Proposition 65**

 · **Chemicals known to cause cancer:**

None of the ingredients are listed.

 · **Chemicals known to cause reproductive toxicity for females:**

None of the ingredients are listed.

 · **Chemicals known to cause reproductive toxicity for males:**

None of the ingredients are listed.

 · **Chemicals known to cause developmental toxicity:**

None of the ingredients are listed.

 · **Carcinogenic categories**

 · **EPA (Environmental Protection Agency)**

7440-22-4 Silver

D

 · **TLV (Threshold Limit Value)**

None of the ingredients are listed.

 · **NIOSH-Ca (National Institute for Occupational Safety and Health)**

None of the ingredients are listed.

 · **Massachusetts State Right To Know List**

7440-22-4 Silver

123-86-4 n-Butyl acetate

 · **New Jersey State Right To Know List**

7440-22-4 Silver

96-48-0 gamma-Butyrolactone

123-86-4 n-Butyl acetate

 · **Pennsylvania Hazardous Substances List**

7440-22-4 Silver

96-48-0 gamma-Butyrolactone

123-86-4 n-Butyl acetate

(Contd. on page 10)

Safety Data Sheet

acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink

(Contd. of page 9)

- **California SCAQMD Rule 443.1 VOC's:** No information available.
- **GHS label elements** The product is classified and labeled according to the Globally Harmonized System (GHS).
- **Hazard pictograms**



GHS02 GHS07 GHS09

- **Signal word** *Warning*
- **Hazard-determining components of labeling:**
n-Butyl acetate
gamma-Butyrolactone
- **Hazard statements**
H226 Flammable liquid and vapor.
H336 May cause drowsiness or dizziness.
H400 Very toxic to aquatic life.
H410 Very toxic to aquatic life with long lasting effects.

- **Precautionary statements**

- | | |
|---|--|
| P210 P261 P273 P280 P301+P310 P302+P352 P304+P341 P305+P351+P338 P333+P313 P337+P313 P370+P378 P403+P233 P501 | Keep away from heat/sparks/open flames/hot surfaces. - No smoking. Avoid breathing dust/fume/gas/mist/vapors/spray Avoid release to the environment. Wear protective gloves/protective clothing/eye protection/face protection. If swallowed: Immediately call a poison center/doctor. If on skin: Wash with plenty of soap and water. If inhaled: If breathing is difficult, remove person to fresh air and keep comfortable for breathing. If in eyes: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If skin irritation or rash occurs: Get medical advice/attention. If eye irritation persists: Get medical advice/attention. In case of fire: Use to extinguish: Alcohol resistant foam, Fire-extinguishing powder, Carbon dioxide. Store in a well-ventilated place. Keep container tightly closed. Dispose of contents/container in accordance with local/regional/national/international regulations. |
|---|--|

- **National regulations:**

- **Other regulations, limitations and prohibitive regulations**

RoHS 2 2011/65/EU along with EU Directive 2002/95/EC – Waste from Electrical and Electronic Equipment (WEEE):
 Applied Ink Solutions products do not exceed the amount of allowable levels concerning: Cadmium (Cd); Hexavalent Chromium (CrVI); Mercury (Hg); Lead (Pb); Polybrominated Biphenyls (PBB's) as bromide; Polybrominated Diphenyl Ethers (PBDEs) as bromide, decaBDE.

Applied Ink Solutions has confirmed with our precious metal suppliers that they do not use conflict minerals, as outlined in the Dodd-Frank Wall Street Reform and Consumer Protection Act in Title XV, Section 1502.

Registration, Evaluation and Authorization of Chemicals (REACH) & Substances of Very High Concern (SVHC):
 This product does not contain substances on the SVHC list.

(Contd. on page 11)

Safety Data Sheet
acc. to OSHA HCS

Printing date 08/11/2022

Reviewed on 08/11/2022

Trade name: AG-1074 Silver Conductive Ink· **Chemical safety assessment:** A Chemical Safety Assessment has not been carried out.

(Contd. of page 10)

16 Other information

This information is based on our present knowledge. However, this shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

- **Department issuing SDS:** Product safety department
- **Contact:** Tom Cole, EHS Manager (tcole@kayakuAM.com)

- **Revision History:** New SDS
- **Date of preparation / last revision** 08/11/2022

· **Abbreviations and acronyms:**

ADR: Accord relatif au transport international des marchandises dangereuses par route (European Agreement Concerning the International Carriage of Dangerous Goods by Road)

IMDG: International Maritime Code for Dangerous Goods

DOT: US Department of Transportation

IATA: International Air Transport Association

EINECS: European Inventory of Existing Commercial Chemical Substances

ELINCS: European List of Notified Chemical Substances

CAS: Chemical Abstracts Service (division of the American Chemical Society)

NFPA: National Fire Protection Association (USA)

HMIS: Hazardous Materials Identification System (USA)

VOC: Volatile Organic Compounds (USA, EU)

PBT: Persistent, Bioaccumulative and Toxic

vPvB: very Persistent and very Bioaccumulative

NIOSH: National Institute for Occupational Safety

OSHA: Occupational Safety & Health

TLV: Threshold Limit Value

PEL: Permissible Exposure Limit

REL: Recommended Exposure Limit

Flammable Liquids 3: Flammable liquids – Category 3

Acute Toxicity - Oral 4: Acute toxicity – Category 4

Eye Damage 1: Serious eye damage/eye irritation – Category 1

Specific Target Organ Toxicity - Single Exposure 3: Specific target organ toxicity (single exposure) – Category 3

Aquatic Acute 1: Hazardous to the aquatic environment - acute aquatic hazard – Category 1

Aquatic Chronic 1: Hazardous to the aquatic environment - long-term aquatic hazard – Category 1