

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A

Safety Data Sheet




Section 1: Identification**Product Identifier and Other Means of Identification****Product Name:** Silver Conductive Epoxy Adhesive: Slow Cure / High Conductivity**SDS Code:** 8331S-Part A**Related Part #** 8331S-15G, 8331S-50ML, 8331S-200ML**Recommended Use and Restriction on Use****Use:** Silver filled electrically conductive adhesive—epoxy resin for use with hardener**Uses Advised Against:** Not available**Details of Manufacturer or Importer****Manufacturer**MG Chemicals
1210 Corporate Drive
Burlington, Ontario L7L 5R6
CANADAMG Chemicals (Head Office)
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CANADA**☎** +1-800-340-0772**FAX** +1-800-340-0773**E-MAIL** support@mgchemicals.com**WEB** www.mgchemicals.com**☎** +1-905-331-1396**FAX** +1-905-331-2682**E-MAIL** info@mgchemicals.com**E-MAIL** (Competent Person): sds@mgchemicals.com**Emergency Phone Number****For hazardous material incidents ONLY**—leaks, spills, fires, exposures or accidentsUSA or CANADA: Call CHEMTREC ☎: **+1-800-424-9300****For emergencies involving dangerous goods:** Collect 24/7CANADA: Call CANUTEC ☎: **+1-613-996-6666** or ***666** on cellular phones

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Section 2: Hazard(s) Identification
Classification of the Hazardous Materials
GHS Categories

Criteria		Category	Signal Word	Pictograms
Germ Cell Mutagenicity		2	Warning	Health
Sensitization	Skin sensitizer	1	Warning	Exclamation
Environmental Hazard	Acute Aqua. Tox.	1	Warning	Environmental
Environmental Hazard	Chronic Aqua. Tox.	1	Warning	Environment

Note: The degree of severity is ranked within each hazard class from 1 (Highest Severity) to up to 5 (Lowest Severity), which is opposite to HMIS and NFPA conventions. Severity category rankings do not allow comparisons between classes.

Label Elements

Signal Word	WARNING
Pictograms	Hazard Statements
	H317: May cause an allergic skin reaction
	H341: Suspected of causing genetic defects
	H410: Very toxic to aquatic life with long lasting effects

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A

Prevention	Precautionary Statements
P102	Keep out of reach of children.
P201 + P202	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.
P261	Avoid breathing fumes/vapors/mist.
P272	Contaminated work clothing must not be allowed out of the workplace.
P280	Wear protective gloves/protective clothing.
P273	Avoid release to the environment.
Response	Precautionary Statements
P302 + P352	IF ON SKIN: Wash with plenty of water.
P333 + P313	IF skin irritation or rash occurs: Get medical advice/attention.
P362 + P364	Take off contaminated clothing and wash it before reuse.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
Storage	Precautionary Statements
P405	Store locked up.
Disposal	Precautionary Statements
P501	Dispose of contents/container in accordance to local/regional/international regulations.

Hazards Not Otherwise Classified

Other Criteria	Hazard Statements/Precautionary Statement	Signal Word	Pictograms
Argyria Warning	Long term ingestion or inhalation of silver can lead to an irreversible blue-grey discoloration of the skin.	<i>None</i>	<i>None</i>
Dermatitis or Eczemas	Prolonged and repeated exposure to uncured epoxy resins may cause dermatitis or eczemas.	<i>None</i>	<i>None</i>

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Section 3: Composition/Information on Ingredients

CAS #	Chemical Name	%(Weight)
7440-22-4	silver (flakes < 1 mm)	67%
28768-32-3	4,4'-methylenebis [N,N-bis(2-oxiranylmethyl) aniline]	31%
17557-23-2	neopentyl glycol diglycidyl ether	2%

Section 4: First-Aid Measures

<i>Exposure Condition</i>	<i>GHS Code: Precautionary Statement</i>
IF ON SKIN	P302 + P352, P362 + P364, P333 + P313
Immediate Symptoms	<i>mild irritation, redness, rash</i>
Response	Wash with plenty of water. Take off contaminated clothing and wash it before reuse. If skin irritation or rash occurs: Get medical advice/attention.
IF INHALED	P304 + P340, P308 + P313
Immediate Symptoms	<i>cough, irritation of the respiratory track, sore throat, asthma</i>
Response	Remove person to fresh air and keep comfortable for breathing. IF exposed or concerned: Get medical advice/attention.
IF IN EYES	P305 + P351 + P338, P333 + P313
Immediate Symptoms	<i>Redness, mild irritation</i>
Response	Rinse cautiously with water for at least 15 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. If eye irritation persists: Get medical attention.
IF SWALLOWED	P301 + P330 + P331, P308 + P313
Immediate Symptoms	<i>Irritation</i>
Response	Rinse mouth. Do not induce vomiting. IF exposed or concerned: Get medical advice/attention.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**Section 5: Fire-Fighting Measures**

Extinguishing Media	In case of fire: Use dry chemical, carbon dioxide, chemical foam, or water spray to extinguish. Use water spray to cool containers.
Specific Hazards	<p>Not flammable or combustible, but will burn if involved in a fire. Produces irritating smoke and toxic fumes in fires.</p> <p>Inhalation of silver oxide fumes may cause metal fever and irritate the respiratory tract. The flu-like symptoms of metal fever may be delayed, occurring 4 to 12 hours after exposure.</p> <p>Prevent fire-fighting wash from entering waterway or sewer system.</p>
Combustion Products	Produces carbon oxides (CO, CO ₂), silver oxide fumes, and smoke
Fire-Fighter	Wear self-contained breathing apparatus and full fire-fighting turn-out gear.

Section 6: Accidental Release Measures

Personal Protection	Use personal protection recommended in Section 8.
Precautions for Response	Avoid breathing the fumes/vapors. Keep away from extreme heat or open flames.
Environmental Precautions	Avoid releasing to the environment. Prevent spill from entering drains and waterways. Do not flush to sewer.
Containment Methods	None required—this product is not readily flowable.
Cleaning Methods	Collect spill in a sealable container. Wipe residue with a paper towel wetted with alcohol (or other suitable organic solvent) and place dirty towels in container. Wash spill area with soap and water to remove the last traces of residue.
Disposal Methods	Dispose of spill waste according to Section 13.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Section 7: Handling and Storage
Prevention

Keep out of reach of children.

Obtain special instructions before use. Do not handle until all safety precautions have been read and understood.

Avoid breathing dust/fumes/mist/vapors.

Contaminated work clothing must not be allowed out of the workplace.

Avoid release to the environment.

Handling

Wear protective gloves/eye protection.

Take off contaminated clothing and wash it before reuse.

Wash hands thoroughly after handling.

Collect spillage.

Storage

Store locked up.

Section 8: Exposure Controls/Personal Protection
Substances with Occupational Exposure Limit Values

Chemical Name	Country or Vendor	Long Term Exposure Limits (PEL)	Short Term Exposure Limits (STEL)
silver (metal dust, mist) (metal) (Ag and its compounds) (metal, dust, fumes)	ACGIH	0.1 mg/m ³	Not established
	U.S.A. OSHA PEL	0.01 mg/m ³	Not established
	Canada AB	0.1 mg/m ³	Not established
	Canada BC	0.01 mg/m ³	0.03 mg/m ³
	Canada ON	0.1 mg/m ³	Not established
	Canada QC	0.1 mg/m ³	Not established

Note: The ACGIH¹, OSHA, and Canadian provinces exposure limits were consulted. Limits from by RTECS database² of the Canadian Centre for Occupational Health and Safety (CCOHS) a data from suppliers' SDS were also consulted.

Engineering Controls
Ventilation

General ventilation is adequate for normal use; keep airborne exposure as low as possible.

RECOMMENDATION: If the product is heated, use of local exhaust or full mask with organic vapor cartridge/independent air supply.

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**Personal Protective Equipment****Eye protection**

Wear appropriate protective eyeglasses or chemical safety goggles.

RECOMMENDATION: Use safety glasses with lateral protection (side shields).

Skin Protection

Wear appropriate protective clothing to prevent skin contact.

RECOMMENDATION: Use butyl rubber, neoprene, or other chemically resistant gloves.

Respiratory Protection

If exposed to high levels of fumes/vapors, wear respirator such as a half-mask respirator with organic vapor cartridge and particulate filter.

If exposed to the product in extreme heat or combustion conditions, wear a NIOSH approved self-contained breathing apparatus (SCBA) or supplied air respirator.

RECOMMENDATION: Consult your local safety supply store to ensure your respirator has a NIOSH (U.S.) approved filter cartridges appropriate for the ingredients listed in section 3 of this SDS. Ensure that the respirator is fitted to the employee by a professional.

General Hygiene Considerations

Wash hands thoroughly with water and soap after handling.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Section 9: Physical and Chemical Properties

Physical State	Solid, paste	Lower Flammability Limit	Not available
Appearance	Silver grey	Upper Flammability Limit	Not available
Odor	Not available	Vapor Pressure @25 °C	Not available
Odor Threshold	Not available	Vapor Density	Not available
pH	Not available	Specific Gravity @20 °C	2.5
Freezing/Melting Point	Not available	Solubility in Water	Insoluble
Boiling Point	Not available	Partition Coefficient	Not applicable
Flash Point ^{a)}	≥127 °C [>261 °F]	Auto-ignition Temperature	Not available
Evaporation Rate	Not available	Decomposition Temperature	Not available
Flammability (solid, gas)	Not available	Viscosity @40 °C	>>20.5 mm ² /s

a) The closed cup flash point values are based on the neopentyl glycol diglycidyl ether component.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**Section 10: Stability and Reactivity**

Reactivity	Reacts exothermically with amines.
Chemical Stability	Chemically stable at normal temperatures and pressures
Conditions to Avoid	Incompatible substances and extreme temperatures
Incompatibilities	Strong oxidizing agents, strong acids, strong bases, acetylene, ammonia, peroxides
Polymerization	Will not occur
Decomposition	For thermal decomposition, see combustion products in Section 5.

Section 11: Toxicological Information**Routes of Exposure**

Ingestion, Inhalation, and Skin contact

Symptoms Summary

Eyes	May causes redness and mild eye irritation.
Skin	May cause mild skin irritation, redness, or rash.
Inhalation	May cause cough, irritation of the respiratory track, sore throat, or asthma.
Ingestion	It may cause irritation (also see inhalation symptoms).
Chronic	Prolonged and repeated exposure may lead to skin sensitization. Prolonged and repeated ingestion or inhalation of silver may yield to an irreversible blue-grey discoloration of the skin. Possible mutagenic effect.

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SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Acute Toxicity (Lethal Exposure Concentrations)

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation
silver	>2 000 mg/kg Rat	>2 000 mg/kg Rabbit	5.16 mg/L Rat 4 h (dust)
4,4'-methylenebis [N,N-bis(2-oxiranylmethyl) aniline]	≥5 000 mg/kg Rat	≥3 000 mg/kg Rabbit	Not available
neopentyl glycol diglycidyl ether	2 000 mg/kg Rat ^{a)}	2 150 mg/kg Rabbit ^{a)}	Not established

Note: Toxicity data from the RTECS² and ECHA databases were consulted. The data from supplier (M)SDS were also consulted.

a) Estimate provided by supplier

Other Toxicological Effects
Skin corrosion/irritation

Mild skin irritant

Serious eye damage/irritation

Mild eye irritant

Respiratory and skin sensitization

(allergic reactions)

The epoxy resin components (CAS# 28768-32-3 and 17557-23-2) may cause skin sensitization in humans

Carcinogenicity

(risk of cancer)

None of the ingredients are classified or listed as a carcinogen by IARC, ACGIH, CA Prop 65, or NTP.

Mutagenicity

(risk of heritable genetic effects)

In vitro and in vivo studies for 4,4'-methylenebis [N,N-bis(2-oxiranylmethyl) aniline] show positive results for mutagenicity.

Reproductive Toxicity

(risk to sex functions)

Based on available data,
 ● the classification criteria are not met.

Teratogenicity

(risk of fetus malformation)

Based on available data,
 the classification criteria are not met.

STOT-single exposure

Based on available data,
 the classification criteria are not met.

STOT-repeated exposure

Based on available data,
 the classification criteria are not met.

Aspiration hazard

Classification criteria are not met: the mixture does not contains Class 1 aspiration toxicant and its viscosity is >20.5 mm²/s at 40 °C.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**Section 12: Ecological Information**

Ecological classifications are based on the IMDG/GHS criteria in conjunction with ecotoxicological data from our suppliers, the European Chemical Agency database (<http://echa.europa.eu>), and other reliable sources.

Contains silver particles of less than a 1 mm but more than 100 nm (larger than nanoparticles), which release ionic silver levels that is very toxic to the environment. While massive silver is insoluble in water, its powders is considered sufficiently soluble to give rise to an ecological hazard by EU regulators. The classification that follows takes into account to chronic aqueous toxicity of category 1 (M = 10 for silver) of the EU.

Similar epoxy resin mixtures with CAS# 25068-38-6 and average molecular weight of less than 700 are generally classified as chronic category 2 marine pollutant due to LC50 96 h of >1 mg/L but ≤10 mg/L.

Acute Ecotoxicity

Category 1

Very toxic to aquatic life

Chronic Ecotoxicity

Category 1

Very toxic to aquatic life with long lasting effect

Avoid release to the environment. Collect spillage.

Persistence and Biodegradability

The content is not readily biodegradable.

Bioaccumulative Potential

Not available

Mobility in Soil

Not available

Other Effects

Not available

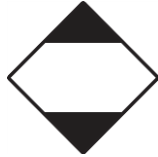
Section 13: Disposal Considerations

Dispose of contents in accordance with all local, provincial, state, and federal regulations.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Section 14: Transport Information
Ground

Refer to TDG regulations (Canadian Transportation of Dangerous Goods regulations);
USA DOT 49 CFR (Parts 100 to 185) **Regulations.**

Sizes 5 kg and under

Limited Quantity


Sizes greater than 5 kg

UN number: UN3077

Shipping Name: ENVIRONMENTALLY
 HAZARDOUS SUBSTANCE, SOLID, N.O.S.
 (silver particles <1 mm; 4,4'-methylenebis
 [N,N-bis(2-oxiranylmethyl) aniline])

Class: 9

Packing Group: III

Marine Pollutant: Yes

Air

Refer to ICAO-IATA Dangerous Goods Regulations.

Sizes 30 g and under

Excepted Quantity

Document as class

E1

 Refer to Package
 Mark 2.6.7.1 in **IATA**
 for further instruction


Sizes greater than 30 g up to 30 kg

Limited Quantity
UN number: UN3077

Shipping Name: ENVIRONMENTALLY
 HAZARDOUS SUBSTANCE, SOLID, N.O.S.
 (silver particles <1 mm; 4,4'-methylenebis
 [N,N-bis(2-oxiranylmethyl) aniline])




Class: 9

Packing Group: III

Marine Pollutant: Yes


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SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A
Sea

Refer to IMDG regulations.	
Sizes 30 g and under Excepted Quantity Document as class E1	
Sizes 5 kg and under Limited Quantity	
	Sizes greater than 5 kg UN number: UN3077 Shipping Name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (silver particles <1 mm; 4,4'-methylenebis [N,N-bis(2-oxiranylmethyl) aniline]) Class: 9 Packing Group: III Marine Pollutant: Yes
	

Note: Shipper must be appropriately trained and certified before involvement with the transport of dangerous goods.

Section 15: Regulatory Information
Canada
WHMIS 1988 Classification


D2A – Very Toxic (Mutagenicity); D2B – Toxic (Skin Sensitizer)

Domestic Substance List (DSL)/Non-Domestic Substance Lists (NDSL)

All hazardous ingredients are listed on the DSL/NDSL.

Industry and Science Canada

MG Labels products intended for the workplace to conform to WHMIS labeling regulations. Product identification, net quantity declaration, minimum printing type size heights, and packaging of this product are in compliance.

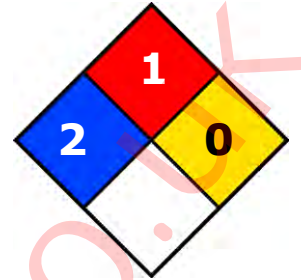
Health Canada

Products produced by MG Chemicals intended for retail display conform to the Canadian Consumer Labeling Regulations.

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SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**USA****Other Classifications****HMIS® RATING**

HEALTH:	* 2
FLAMMABILITY:	1
PHYSICAL HAZARD:	0
PERSONAL PROTECTION:	

NFPA® 704 CODES

Approximate HMIS and NFPA Risk Ratings Legend:

0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

CAA (Clean Air Act, USA)

This product does not contain any class 1 ozone depleting substances.

This product does not contain any class 2 ozone depleting substances.

This product does not contain substances that are listed as hazardous air pollutants.

EPCRA (Emergency Planning and Right to Know Act, USA, 40 CFR 372.45)

This product contains silver (CAS# 7440-22-4; reportable quantity = 1000 lb), which is subject to the reporting requirements of section 313 Title III of the SARA of 1986 and 40 CFR part 372.

TSCA (Toxic Substances Control Act of 1976, USA)

All substances are TSCA listed.

California Proposition 65 (Chemicals known to cause cancer or reproductive toxicity, Sept 2, 2011 revision, USA).

This product does not contain any listed substances in California.

Europe**RoHS** (Restriction of Hazardous Substances Directive)

This product does not contain any lead, cadmium, mercury, hexavalent chromium, PBB's, or PBDE's, and complies with European RoHS regulations.

WEEE (Waste Electrical and Electronic Equipment Directive)

This product is not a piece of electrical or electronics equipment, and is therefore not governed by this regulation.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**Section 16: Other Information**

SDS Prepared by Michel Hachey
Date of Revision 26 September 2015
Supersedes 16 January 2013

Reason for Changes: Revised to better harmonize and meet HCS2012 and WHMIS 2015 requirements.

Reference

- 1) ACGIH *2013 TLVs and BEIs: Based on the documentation of the threshold limit values for chemical substances and physical agents & biological exposure indices*, American Conference of Governmental of Industrial Hygienist Cincinnati, OH (2013).
- 2) All toxicological data were checked against the RTECS (Registry of Toxic Effects of Chemical Substances®)

Abbreviations

ACGIH	American Conference of Governmental Industrial Hygienists (USA)
EC50	Half maximal effective concentration
EL50	Half maximal effective loading
NOELR	No observable effect loading ratio
GHS	Globally Harmonized System of Classification of Labeling of Chemicals
LC50	Lethal Concentration 50%
LCLo	Lowest published lethal concentration
LD50	Lethal Dose 50%
PEL	Permissible Exposure Limit
STEL	Short-Term Exposure Limit
TCLo	Lowest published toxic concentration
TWA	Time Weighted Average
VOC	Volatile Organic Content

Technical Queries Contact us regarding any questions, improvement suggestions, or problems with this product. Application notes, instructions, and FAQs are located at www.mgchemicals.com.

Email: support@mgchemicals.com

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SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART A**Mailing Addresses** *Manufacturing & Support*

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Disclaimer

This material safety data sheet is provided as an information resource only. *M.G. Chemicals, Ltd.* believes the information contained herein is accurate and compiled from reliable sources. It is the responsibility of the user to query and verify any information seeming suspect where doubt on the validity may exist. The buyer assumes all responsibility of using and handling the product in accordance with local, regional, national, and international regulations.

www.techsil.com

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B

Safety Data Sheet




Section 1: Identification**Product Identifier and Other Means of Identification****Product Name:** Silver Conductive Epoxy Adhesive: Slow Cure / High Conductivity**SDS Code:** 8331S-Part B**Related Part #** 8331S-15G, 8331S-50ML, 8331S-200ML**Recommended Use and Restriction on Use****Use:** Silver filled electrically conductive adhesive—epoxy hardener for use with resins**Uses Advised Against:** Not available**Details of Manufacturer or Importer****Manufacturer**MG Chemicals
1210 Corporate Drive
Burlington, Ontario L7L 5R6
CANADAMG Chemicals (Head Office)
9347-193 Street
Surrey, British Columbia V4N 4E7
CANADA**☎** +1-800-340-0772**FAX** +1-800-340-0773**E-MAIL** support@mgchemicals.com**WEB** www.mgchemicals.com**☎** +1-905-331-1396**FAX** +1-905-331-2682**E-MAIL** info@mgchemicals.com**E-MAIL** (Competent Person): sds@mgchemicals.com**Emergency Phone Number****For hazardous material incidents ONLY**—leaks, spills, fires, exposures or accidentsUSA or CANADA: Call CHEMTREC ☎: **+1-800-424-9300****For emergencies involving dangerous goods:** Collect 24/7CANADA: Call CANUTEC ☎: **+1-613-996-6666** or ***666** on cellular phones

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B
Section 2: Hazard(s) Identification
Classification of the Hazardous Materials
GHS Categories

Criteria		Category	Signal Word	Pictograms
Serious Eye Damage		1	Danger	Corrosion
Sensitization	Skin sensitizer	1	Warning	Exclamation
Skin Irritant		2	Warning	Exclamation
Environmental Hazard	Chronic Aqua. Tox.	1	Warning	Environment
Environmental Hazard	Acute Aqua. Tox.	1	Warning	Environment

Note: The degree of severity is ranked within each hazard class from 1 (Highest Severity) to up to 5 (Lowest Severity), which is opposite to HMIS and NFPA conventions. Severity category rankings do not allow comparisons between classes.

Label Elements

Signal Word	DANGER
Pictograms	Hazard Statements
	H318: Causes serious eye damage
	H315: Causes skin irritation H317: May cause an allergic skin reaction
	H410: Very toxic to aquatic life with long lasting effects

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B

Prevention	Precautionary Statements
P102	Keep out of reach of children.
P261	Avoid breathing fumes/vapors.
P280	Wear protective gloves/protective clothing/eye protection/face protection.
P264	Wash hands thoroughly after handling.
P272	Contaminated work clothing must not be allowed out of the workplace.
P273	Avoid release to the environment.
Response	Precautionary Statements
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 a POISON CENTER/doctor.
P302 + P352, P362 + P364	IF ON SKIN: Wash with plenty of water. Take off contaminated clothing and wash it before reuse.
P333 + P313	If skin irritation or rash occurs: Get medical advice/attention.
P391	Collect spillage.
Disposal	Precautionary Statements
P501	Dispose of contents/container in accordance to local/regional/international regulations.

Hazards Not Otherwise Classified

Other Criteria	Hazard Statements/Precautionary Statement	Signal Word	Pictograms
Argyria Warning	Long term ingestion or inhalation of silver can lead to an irreversible blue-grey discoloration of the skin.	<i>None</i>	<i>None</i>

Section 3: Composition/Information on Ingredients

CAS #	Chemical Name	%(Weight)
7440-22-4	silver	67%
68541-13-9	9,12-octadecadienoic acid-based polyamidoamine	15%
68082-29-1	fatty acid-polyethylamine polymer	14%
4246-51-9	3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine	3%
112-24-3	triethylenetetramine	1%

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Section 4: First-Aid Measures**

<i>Exposure Condition</i>	<i>GHS Code: Precautionary Statement</i>
IF IN EYES	P305 + P351 + P338, P310
Immediate Symptoms	<i>redness, severe irritation, pain, burns</i>
Response	Rinse cautiously with water for at least 20 minutes. Remove contact lenses, if present and easy to do. Continue rinsing. Immediately call a POISON CENTER/doctor.
IF ON SKIN	P302 + P352, P362 + P364, P333 + P313
Immediate or Delayed Symptoms	<i>redness, severe irritation, rash (allergic contact dermatitis)</i>
Response	Wash with plenty of water. Take off contaminated clothing and wash it before reuse. If skin irritation or rash occurs: Get medical advice/attention.
IF INHALED	P304 + P340
Immediate Symptoms	<i>cough, irritation of the respiratory track</i>
Response	Remove person to fresh air and keep comfortable for breathing.
IF SWALLOWED	P301 + P330 + P331
Immediate Symptoms	<i>not available</i>
Response	Rinse mouth. Do not induce vomiting.

Advice to Physicians

In case of exposure to nitrogen oxides (NOx) combustion products or triethylenetetramine vapors during a fire, the symptoms may be delayed. For significant exposures, the exposed person should be kept under medical surveillance for 48 hours.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Section 5: Fire-Fighting Measures**

Extinguishing Media	In case of fire: Use dry chemical, carbon dioxide, chemical foam, or water spray to extinguish. Use water spray to cool containers.
Specific Hazards	<p>Not flammable or combustible, but burns if involved in a fire. Produces irritating and toxic fumes in fires or in contact with hot surfaces.</p> <p>Inhalation of toxic smoke during fire may have delayed effects. Exposed person may need to be put under surveillance for 48 h.</p> <p>Toxic for aquatic environment: Prevent fire-fighting wash from entering waterway or sewer system.</p>
Combustion Products	Produces carbon oxides (CO, CO ₂), ammonia, nitric acid, nitrogen oxides (NO _x), and silver metal fumes.
Fire-Fighter	Wear self-contained breathing apparatus and full fire-fighting turn-out gear.

Section 6: Accidental Release Measures

Personal Protection	Use personal protection recommended in Section 8.
Precautions for Response	Avoid breathing the fumes/vapors.
Environmental Precautions	Avoid releasing to the environment. Prevent spill from entering drains and waterways. Do not flush to sewer.
Containment Methods	None required—this product is not readily flowable.
Cleaning Methods	<p>Collect liquid in a sealable container. Wipe residue with a paper towel wetted with a suitable organic solvent such as alcohol or ethyl lactate, and place dirty towels in container. Wash spill area with soap and water to remove the last traces of residue.</p> <p>Recommendation: Use a plastic, stainless steel, or carbon steel container. Avoid containers with copper, aluminum, zinc, or galvanized surfaces since the waste material can slowly oxidize them.</p>
Disposal Methods	Dispose spill waste according to Section 13.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B
Section 7: Handling and Storage
Prevention

Keep out of reach of children.

Avoid breathing fumes/mist/vapors or contact with skin or eyes.

Contaminated work clothing must not be allowed out of the workplace.

Do not eat, drink, or smoke when using this product.

Handling

Wear protective gloves/protective clothing/eye protection/face protection.

Take off contaminated clothing and wash it before reuse.

Wash hands thoroughly after handling.

Avoid release to the environment. Collect spillage.

Storage

Do not store near acids or other incompatible substances.

Section 8: Exposure Controls/Personal Protection
Substances with Occupational Exposure Limit Values

Chemical Name	Country or Vendor	Long Term Exposure Limits (PEL)	Short Term Exposure Limits (STEL)
silver (metal dust, mist) (metal) (Ag and its compounds) (metal, dust, fumes)	ACGIH	0.1 mg/m ³	Not established
	U.S.A. OSHA PEL	0.01 mg/m ³	Not established
	Canada AB	0.1 mg/m ³	Not established
	Canada BC	0.01 mg/m ³	0.03 mg/m ³
	Canada ON	0.1 mg/m ³	Not established
	Canada QC	0.1 mg/m ³	Not established
triethylenetetramine	ACGIH	Not established	Not established
	U.S.A. OSHA PEL	Not established	Not established
	U.S.A (WEEL)	1 ppm	Not established
	Canada AB	Not established	Not established
	Canada BC	Not established	Not established
	Canada ON	0.5 mg/m ³ (Skin) ^{a)}	Not established
	Canada QC	Not established	Not established

Note: The ACGIH¹, OSHA, and Canadian provinces exposure limits were consulted. Limits from by RTECS database² and **from suppliers' SDS were also consulted.** Short term exposure limits (STEL) are usually for 15 min and long term permissible exposure limits (PEL) for 8 h.

a) Skin—can be absorbed through the skin.

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Engineering Controls****Ventilation**

Keep airborne concentrations below the occupational exposure limits (OEL).

Due to low vapor pressure of the product, general ventilation should be adequate for normal use. If the product is heated at high temperatures or worker is allergic, use local ventilation and consider using a full mask with organic vapor cartridges.

Personal Protective Equipment**Eye protection**

Wear appropriate protective eyeglasses or chemical safety goggles.

RECOMMENDATION: Use safety glasses with lateral protection (side shields).

Skin Protection

For likely contacts, use of protective butyl rubber, neoprene, or other chemically resistant gloves.

For incidental contacts, use nitrile or other chemically resistant gloves.

Respiratory Protection

For over-exposures up to 10 x OEL of mist/vapors/spray, wear respirator such as a half-mask respirator with organic vapor cartridges.

Above 10 x OEL, use a positive-pressure, air-supplied respirator or a self-contained breathing apparatus.

If the product is heated or worker has a known allergic reaction, consider using a full mask with organic vapor cartridge or with an independent air supply.

RECOMMENDATION: Consult your local safety supply store to ensure your respirator has a NIOSH (U.S.) approved filter cartridges appropriate for the ingredients listed in section 3 of this SDS, and that the respirator is fitted to the employee by a professional. Ensure vapor cartridges are stored in sealed plastic bags when not being used.

General Hygiene Considerations

Wash hands thoroughly with water and soap after handling.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B
Section 9: Physical and Chemical Properties

Physical State	Paste, solid	Lower Flammability Limit	Not available
Appearance	Silver grey	Upper Flammability Limit	Not available
Odor	Amine-like	Vapor Pressure @20 °C^{b)}	<0.48 kPa [<3.6 mmHg]
Odor Threshold	Not available	Vapor Density	Not available
pH	Not available	Specific Gravity @25 °C	2.3
Freezing/Melting Point	Not available	Solubility in Water	Slightly soluble
Boiling Point^{a)}	>221 °C [>430 °F]	Partition Coefficient	Not available
Flash Point^{a)}	>>93 °C [>>200 °F]	Auto-ignition Temperature	Not available
Evaporation Rate	Not available	Decomposition Temperature	Not available
Flammability (solid, gas)	Not available	Viscosity @25 °C	>>20.5 mm ² /s

a) The boiling point and closed cup flash point values are based on the lowest value component: 3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine.

b) Based on highest vapor pressure component

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Section 10: Stability and Reactivity**

Reactivity	Reacts exothermically with ketones, and epoxides. May react violently with peroxides. May slowly attack metals such as aluminum, zinc, copper, and their alloys.
Chemical Stability	Chemically stable at normal temperatures and pressures
Conditions to Avoid	Avoid excessive heat and incompatible substances.
Incompatibilities	Strong oxidizing agents, strong acids, peroxides
Polymerization	Will not occur
Decomposition	For thermal decomposition, see combustion products in Section 5

Section 11: Toxicological Information**Routes of Exposure**

Eye Contact, Skin contact, Inhalation, and Ingestion

Symptoms Summary

Eyes	May causes redness, severe eye irritation, pain, or corrosive eye damage.
Skin	May cause redness, serious skin irritation, and allergic contact dermatitis. Triethylenetetramine can be absorbed through skin leading to toxic effects. When heated, hot triethylenetetramine vapors may also result in itching of the face with skin redness (erythema) and swelling (edema).
Inhalation	Inhalation of vapors or mist may cause irritation to the nose, throat and lung (upper respiratory tract) and coughing.
Ingestion	(See inhalation symptoms.)
Chronic	Prolonged and repeated exposure to uncured epoxy hardener may lead to skin sensitization. Prolonged and repeated ingestion or inhalation of silver may yield to an irreversible blue-grey discoloration of the skin.

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B
Lethal Exposure Concentrations

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation
silver	>2 000 mg/kg Rat	>2 000 mg/kg Rat	5.16 mg/L 4 h Rat (dust)
9,12-octadecadienoic acid-based polyamidoamine	Not available	Not available	Not available
fatty acid-polyethylamine polymer	>2 000 mg/kg Rat	2 000 mg/kg Rat	Not available
3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine	4 310 mg/kg Rat ^{a)}	2 510 mg/kg Rat	Not available
triethylenetetramine	2 500 mg/kg Rat	805 mg/kg Rabbit	Not available

Note: Toxicity data from the RTECS² and ECHA databases were consulted. The data from supplier (M)SDS were also consulted.

a) Supplier MSDS

Other Toxicological Effects
Skin corrosion/irritation

Severe skin irritant. The triethylenetetramine (CAS#112-24-3) and 3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine components bring a Category 1 contribution of about 4%, giving an overall category 2 rating.

Serious eye damage/irritation

The proportions of triethylenetetramine (CAS#112-24-3), fatty acid-polyethylamine polymer (CAS# 68082-29-1), and 3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine components (CAS# 4246-51-9) cause severe eye damage. Contains mechanically abrasive particles

Respiratory and skin sensitization (allergic reactions)

Triethylenetetramine (CAS#112-24-3), fatty acid-polyethylamine polymer (CAS# 68082-29-1), and 3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine components (CAS# 4246-51-9) may cause skin sensitization according to animal studies.

Carcinogenicity (risk of cancer)

None of the ingredients are classified or listed as a carcinogen by IARC, ACGIH, CA Prop 65, or NTP

Mutagenicity (risk of heritable genetic effects)

Based on available data, the classification criteria are not met.

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Reproductive Toxicity**

(risk to sex functions)

Based on available data,
the classification criteria are not met.**Teratogenicity**

(risk of fetus malformation)

Based on available data,
the classification criteria are not met.**STOT-single exposure**Based on available data,
the classification criteria are not met.**STOT-repeated exposure**Based on available data,
the classification criteria are not met.**Aspiration hazard**Based on available data, the classification criteria are not met. There is no category 1 components, and the kinematic viscosity is $>>20.5 \text{ mm}^2/\text{s}$ at $40 \text{ }^\circ\text{C}$.**Section 12: Ecological Information**

Ecological classifications are based on the IMDG/GHS criteria in conjunction with ecotoxicological data from our suppliers, the European Chemical Agency database (<http://echa.europa.eu>), and other reliable sources.

Contains silver particles of less than a 1 mm but more than 100 nm (larger than nanoparticles), which release ionic silver levels that is very toxic to the environment. While massive silver is insoluble in water, its powders is considered sufficiently soluble to give rise to an ecological hazard by EU regulators. The classification that follows takes into account to chronic aqueous toxicity of category 1 (M = 10 for silver) of the EU.

The fatty acid-polyethylamine polymer is classified as a chronic category 2 environmental toxicant.

The 3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine is classified as a chronic category 3 environmental toxicant.

The 9,12-octadecadienoic acid-based polyamidoamine is not classified as an ecotoxic substance.

Literature values for the triethylenetetramine (CAS # 112-24-3) suggest an acute category 3 aquatic toxicity (LC50, IC50, and EC50 values of $>100 \text{ mg/L}$ for fish and between 10 and 100 mg/L for algae).

Acute Ecotoxicity

Category 1

Very toxic to aquatic life

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Chronic Ecotoxicity**

Category 1

Very toxic to aquatic life with long lasting effect

Avoid release to the environment. Collect spillage.

Biodegradability

Not readily biodegradable

Bioaccumulation

Not available

Other Effects

Not available

Section 13: Disposal Considerations

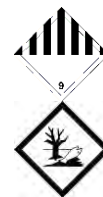
Dispose of contents in accordance with all local, provincial, state, and federal regulations.

Section 14: Transport Information**Ground****Refer to TDG regulations** (Canadian Transportation of Dangerous Goods regulations);
USA DOT 49 CFR (Parts 100 to 185) **Regulations.**

Sizes 5 kg and under

Limited Quantity

Sizes greater than 5 kg

UN number: UN3077**Shipping Name:** ENVIRONMENTALLY
HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(silver particles <1 mm)**Class:** 9**Packing Group:** III**Marine Pollutant:** Yes*Section continued on the next page*

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B
Air
Refer to ICAO-IATA Dangerous Goods Regulations.

Sizes 30 g and under

Excepted Quantity

Document as class

E1

Refer to Package

 Mark 2.6.7.1 in **IATA**

for further instruction



Sizes greater than 30 g up to 30 kg

Limited Quantity
UN number: UN3077

Shipping Name: ENVIRONMENTALLY
HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(silver particles <1 mm)

Class: 9

Packing Group: III

Marine Pollutant: Yes

Sea
Refer to IMDG regulations.

Sizes 30 g and under

Excepted Quantity

Document as class

E1


Sizes 5 kg and under

Limited Quantity

Sizes greater than 5 kg

UN number: UN3077

Shipping Name: ENVIRONMENTALLY
HAZARDOUS SUBSTANCE, SOLID, N.O.S.
(silver particles <1 mm)

Class: 9

Packing Group: III

Marine Pollutant: Yes


Note: Shipper must be appropriately trained and certified before involvement with the transport of dangerous goods.

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B
Section 15: Regulatory Information
Canada
WHMIS 1988 Classification


E – Corrosive (Chemical burns); D1B – Toxic (Skin Absorption);
D2B – Toxic Other (Skin Sensitizer)

Domestic Substance List (DSL)/Non-Domestic Substance Lists (NDSL)

All hazardous ingredients are listed on the DSL/NDSL.

Industry and Science Canada

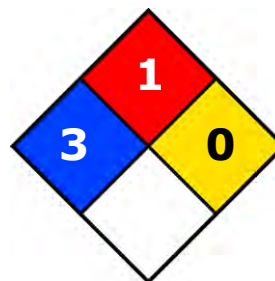
MG Labels products intended for the workplace to conform to WHMIS labeling regulations. Product identification, net quantity declaration, minimum printing type size heights, and packaging of this product are in compliance.

Health Canada

Products produced by MG Chemicals intended for retail display conform to the Canadian Consumer Labeling Regulations.

USA
Other Classifications
HMIS® RATING

HEALTH:	* 3
FLAMMABILITY:	1
PHYSICAL HAZARD:	0
PERSONAL PROTECTION:	

NFPA® 704 CODES


Approximate HMIS and NFPA Risk Ratings Legend:

0 (Low or none); 1 (Slight); 2 (Moderate); 3 (Serious); 4 (Severe)

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**CAA** (Clean Air Act, USA)

This product does not contain any class 1 ozone depleting substances.

This product does not contain any class 2 ozone depleting substances.

This product does not contain substances that are listed as hazardous air pollutants.

EPCRA (Emergency Planning and Right to Know Act, USA, 40 CFR 372.45)

This product contains silver (CAS# 7440-22-4; reportable quantity = 1000 lb), which is subject to the reporting requirements of section 313 Title III of the SARA of 1986 and 40 CFR part 372.

TSCA (Toxic Substances Control Act of 1976, USA)

All substances are TSCA listed.

California Proposition 65 (Chemicals known to cause cancer or reproductive toxicity, Sept 2, 2011 revision, USA).

This product does not contain any listed substances in California.

Europe**RoHS** (Restriction of Hazardous Substances Directive)

This product does not contain any lead, cadmium, mercury, hexavalent chromium, PBB's, or PBDE's, and complies with European RoHS regulations.

WEEE (Waste Electrical and Electronic Equipment Directive)

This product is not a piece of electrical or electronics equipment, and is therefore not governed by this regulation.

Section 16: Other Information

SDS Prepared by Michel Hachey

Date of Revision 26 September 2015

Supersedes 16 January 2013

Reason for Changes: Revised to better harmonize and meet HCS2012 and WHMIS 2015 requirements.

Reference

1) ACGIH *2013 TLVs and BEIs: Based on the documentation of the threshold limit values for chemical substances and physical agents & biological exposure indices*, American Conference of Governmental of Industrial Hygienist Cincinnati, OH (2013).

2) All toxicological data were checked against the RTECS (Registry of Toxic Effects of Chemical Substances®)

Section continued on the next page

SILVER CONDUCTIVE EPOXY ADHESIVE: SLOW CURE/HIGH CONDUCTIVITY 8331S-PART B**Abbreviations**

ACGIH	American Conference of Governmental Industrial Hygienists (USA)
EC50	Half maximal effective concentration
EL50	Half maximal effective loading
NOELR	No observable effect loading ratio
GHS	Globally Harmonized System of Classification of Labeling of Chemicals
LC50	Lethal Concentration 50%
LCLo	Lowest published lethal concentration
LD50	Lethal Dose 50%
PEL	Permissible Exposure Limit
STEL	Short-Term Exposure Limit
TCLo	Lowest published toxic concentration
TWA	Time Weighted Average
VOC	Volatile Organic Content

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