

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A

Safety Data Sheet

Section 1: Identification**Product Identifier and Other Means of Identification****Product Name:** Silver Conductive Epoxy Adhesive, Moderate Cure / High Conductivity**SDS Code:** 8331-Part A**Related Part #** 8331-14G, 8331-50ML, 8331-200ML (withdrawn: 8331-429G, 8331-454G)**Recommended Use and Restriction on Use****Use:** Electrically conductive epoxy adhesive resin part for use with hardeners**Uses Advised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, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A

Section 2: Hazard(s) Identification

Classification of Hazardous Chemical

GHS Categories

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

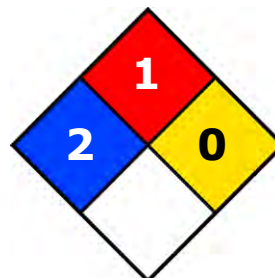
Note: The degree of severity is ranked within each hazard class from 1 (Highest Severity) to up to 5 (Lowest Severity), which is opposite to HMIS and NFPA conventions. Severity category rankings do not allow comparisons between classes.

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)

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SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A

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
Prevention	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.
P261	Avoid breathing fumes/vapors.
P280	Wear protective gloves.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A
Continued...

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	For all routes of exposure: If exposed or concerned: Get medical advice.
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
Defats skin	Repeated exposure may cause skin dryness or cracking.	<i>None</i>	<i>None</i>
Argyria	Long term exposure to silver powder or compounds 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%
28768-32-3	4,4'-methylenebis[N,N-bis(2,3-epoxypropyl)aniline]	33%

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A

Section 4: First-Aid Measures

<i>Exposure Condition</i>	<i>GHS Code/Symptoms/Precautionary Statements</i>
IF ON SKIN	P302 + P352, P333 + P313, P362 + P364
Immediate or Delayed Symptoms	<i>redness, mild irritation, dry skin, rash</i>
Response	Wash with plenty of water. If skin irritation or rash occurs: Get medical advice/attention. Take off contaminated clothing and wash it before reuse.
IF IN EYES	P305 + P351 + P338, P337 + 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 advice/attention.
IF INHALED	P304 + P340, P312, P308 + P313
Immediate Symptoms	<i>cough, irritation of the respiratory track</i>
Response	Remove person to fresh air and keep comfortable for breathing. IF exposed or concerned: Get medical advice/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, MODERATE CURE/HIGH CONDUCTIVITY 8331-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.
Specific Hazards	Not flammable or combustible, but burns if involved in a fire. Produces irritating smoke of unknown toxicity in fires. 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. Prevent fire-fighting wash from entering waterway or sewer system.
Combustion Products	Produces carbon oxides (CO,CO ₂), and toxic metal fumes.
Fire-Fighter	Wear self-contained breathing apparatus and full fire-fighting turn-out gear.

Section 6: Accidental Release Measures

Personal Protection	See personal protection recommendations in Section 8.
Precautions for Response	Avoid breathing the fumes/mist/vapors. Remove or keep away all sources of extreme heat or open flames.
Environmental Precautions	Avoid releasing to the environment. Prevent spill from entering drains and waterways.
Containment Methods	No containment method required—this product is not readily flowable
Cleaning Methods	Collect liquid in a sealable, chemical-resistant container. Sprinkle inert absorbent compound onto spill, then sweep into the container. Wash residue with a paper towel wetted with alcohol, ethyl lactate, or another suitable organic solvent; and place dirty towels in container. Use soap and water to remove the last traces of residue.
Disposal Methods	Dispose of spill waste according to Section 13.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-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.
- Take off contaminated clothing and wash it before reuse. Contaminated work clothing should not be allowed out of the workplace.
- Avoid breathing fumes/mist/vapors or contact with skin or eyes.
- Do not eat, drink, or smoke when using this product.
- Avoid release to the environment.
- Handling** Wear protective gloves/clothing/eye protection.
- Wash hands thoroughly after handling.
- Collect spillage.
- Storage** Keep container tightly closed.
- Store locked up.

Section 8: Exposure Controls/Personal Protection

Substances with Occupational Exposure Limit Values

Chemical Name	Country	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	3 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. Short term exposure limits (STEL) are usually for 15 min and long term permissible exposure limits (PEL) for 8 h.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A**Engineering Controls****Ventilation**

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

Because the silver flakes are inextricably bound to the adhesive mixture; therefore they are not available as airborne hazards under normal use. Ensure adequate ventilation if the product is mechanically misted or aerosolized.

Personal Protective Equipment**Eye protection**

Wear appropriate protective eyeglasses or chemical safety goggles.

Recommendation: Ensure that glasses have side shields for lateral protection.

Skin Protection

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

For incidental contacts, use chemically resistant gloves.

Respiratory Protection

For over-exposures up to 10 x OEL of dust/mist/fumes, wear respirator such as a half-mask respirator with organic vapor cartridges and particulate filter.

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

If the product is heated or the 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 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.

General Hygiene Considerations

Wash hands thoroughly with water and soap after handling.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-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	Slight	Vapor Pressure @20 °C	Not available
Odor Threshold	Not available	Vapor Density	Not available
pH	Not available	Specific Gravity @25 °C	2.5
Freezing/Melting Point	Not available	Solubility in Water	Insoluble
Boiling Point	Not available	Partition Coefficient	Not available
Flash Point ^{a)}	>150°C [>302 °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 4,4'-methylenebis [N,N-bis(2-oxiranylmethyl) aniline] resin component.

Section 10: Stability and Reactivity

Reactivity	Reacts exothermically with amines.
Chemical Stability	Chemically stable at normal temperatures and pressures
Conditions to Avoid	Avoid ignition sources, open flames, and incompatible substances. Do not use in a way that forms mist or aerosolizes the product.
Incompatibilities	Avoid strong oxidizing agents, strong acids, strong bases, ammonia, peroxides, perchlorates, phosphorus, selenium, and sulfur.
Polymerization	Will not occur
Decomposition	Will not decompose under normal conditions. For thermal decomposition, see combustion products in Section 5.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A

Section 11: Toxicological Information

Routes of Exposure

Skin contact, Inhalation, Ingestion, and Eye contact

Symptoms Summary

- Eyes** May cause redness and mild irritation.
- Skin** May cause skin redness, mild irritation, dry skin, or allergic contact dermatitis.
- Inhalation** May cause cough, respiratory irritation, sore throat, or asthma.
- Ingestion** It may cause irritation (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.

Acute Toxicity (Lethal Exposure Concentrations)

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation
silver	>5 g/kg Guinea Pig	≥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	24 000 mg/m ³ Rat ≥4 h (vapor)

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

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A**Other Toxicological Effects**

Skin corrosion/irritation	Mild skin irritant.
Serious eye damage/irritation	Causes mild eye irritation. Contains mechanically abrasive particles.
Sensitization (allergic reactions)	The epoxy resin components (CAS# 28768-32-3) 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	Based on available data, the classification criteria are not met. The mixture does not contain Class 1 aspiration toxicant and its viscosity is $>20.5 \text{ mm}^2/\text{s}$ at $40 \text{ }^\circ\text{C}$.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-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.

In Europe, similar epoxy resin with CAS# 28768-32-3 is 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 effects

Avoid release to the environment. Collect spillage.

Biodegradability

Not readily biodegradable

Bioaccumulation

Not available

Other Effects

Not available

Section 13: Disposal Information

Dispose of contents in accordance with all local, regional, national, and international regulations.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A

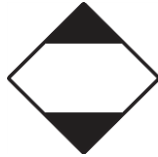
Section 14: Transport Information

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

Flash Point ≥ 150 °C [≥ 302 °F]



Air

Refer to ICAO-IATA Dangerous Goods Regulations.

Sizes 30 g and under

Excepted Quantity

Document as class

E1



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

Flash Point ≥ 150 °C [≥ 302 °F]



Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A**Sea**

Refer to IMDG regulations.	
Sizes 30 g and under Excepted Quantity Document as class E1	Sizes greater than 5 kg
 Class 9 Shipper name	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
Sizes 5 kg and under Limited Quantity	 Flash Point ≥150 °C [≥302 °F]

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.

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.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A**USA****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, June 06, 2014 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 Review 18 June 2015

Supersedes 05 August 2014

Reason for Changes: Changes to better meet HCS 2012 and WHMIS 2015 requirements. Small formulation change due to raw material supplier composition declaration.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART A**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)
ECHA	European Chemicals Agency
EC50	Half maximal effective concentration
EL50	Half maximal effective loading
IARC	International Agency for Research on Cancer
NOELR	No observable effect loading ratio
NTP	National Toxicology Program
GHS	Globally Harmonized System of Classification of Labeling of Chemicals
LC50	Lethal Concentration 50%
LCLo	Lowest published lethal concentration
LD50	Lethal Dose 50%
OEL	Occupational Exposure Limit
PEL	Permissible Exposure Limit
SDS	Safety Data Sheet
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.

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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.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B

Safety Data Sheet

Section 1: Identification**Product Identifier and Other Means of Identification****Product Name:** Silver Conductive Epoxy Adhesive: Moderate Cure / High Conductivity**SDS Code:** 8331-Part B**Related Part #** 8331-14G, 8331-50ML, 8331-200ML (withdrawn: 8331-429G, 8331-454G)**Recommended Use and Restriction on Use****Use:** Electrically conductive epoxy adhesive hardener part 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

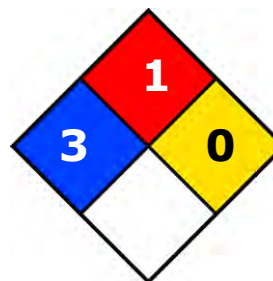
SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
Section 2: Hazard(s) Identification
Classification of the Chemical Material
GHS Categories

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

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, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
Label Elements

Signal Word	DANGER
Pictograms	Hazard Statements
	H314: Causes severe skin burns and eye damage
	H317: May cause an allergic skin reaction
	H361: Suspected of damaging fertility or the unborn child
	H410: Very toxic to aquatic life with long lasting effects
Prevention	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.
P260	Do not breathe fumes/vapors.
P280	Wear protective gloves/eye protection/face protection.
P264	Wash hands thoroughly after handling.
P272	Contaminated work clothing should not be allowed out of the workplace.
P273	Avoid release to the environment.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B

Continued...

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 or doctor.
P301+ P330 + P331, P310	IF SWALLOWED: Rinse mouth. Do NOT induce vomiting. Immediately call a POISON CENTER or doctor.
P303 + P361 + P353, P310	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Immediately call a POISON CENTER or doctor.
P363	Wash contaminated clothing before reuse.
P333 + P313	If skin irritation or rash occurs: Get medical advice/attention.
P304 + P340, P310	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTER or doctor.
P308 + P313	For all routes of exposure: If exposed or concerned: Get medical advice.
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	Long term ingestion or inhalation of silver can lead to an irreversible blue-grey discoloration of the skin.	<i>None</i>	<i>None</i>

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
Section 3: Composition/Information on Ingredients

CAS #	Chemical Name	%(weight)
7440-22-4	silver	67%
84852-15-3	4-nonyl phenol, branched	22%
140-31-8	1-piperazineethanamine	7%
68411-71-2	diethylene triamine, reaction product with diglycidyl ether of Bisphenol A	1%
111-40-0	diethylene triamine	1%
80-05-7	4,4'-isopropylidenediphenol	1%

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	P303 + P361+ P353, P310, P333 +P313, P363
Immediate or Delayed Symptoms	<i>redness, rash (allergic contact dermatitis), severe irritation, pain, burns, blistering</i>
Response	Take off immediately all contaminated clothing. Wash with plenty of water/shower. Immediately call a POISON CENTRE/doctor. If skin irritation or rash occurs: Get medical advice/attention. Wash contaminated clothing before reuse.
IF INHALED	P304 + P340, P310, P308 + P313
Immediate Symptoms	<i>cough, severe irritation or burns of the respiratory track</i>
Response	Remove person to fresh air and keep comfortable for breathing. Immediately call a POISON CENTRE/doctor. IF exposed or concerned: Get medical advice/attention.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B

IF SWALLOWED	P301 + P330, P331, P310, P308 + P313
Immediate Symptoms	<i>severe irritation, burns to mouth, throat, stomach</i>
Response	Rinse mouth. Do not induce vomiting. Immediately call a POISON CENTRE/doctor. IF exposed or concerned: Get medical advice/attention.

Section 5: Fire-Fighting Measures

Extinguishing Media	In case of fire: Use dry chemical, carbon dioxide, or chemical foam to extinguish. Use water spray to cool containers. COUNTER INDICATION: Avoid use of water jet as extinguishing media.
Specific Hazards	Not flammable or combustible, but will burn if involved in a fire. Produces irritating smoke and toxic smoke in fires. 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. Prevent fire-fighting wash from entering waterway or sewer system.
Combustion Products	Produces carbon oxides (CO, CO ₂), nitrogen oxides (NO _x), amines, silver oxide fumes and other toxic 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	Do not breathe fumes/mist/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.

Continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B

- Containment Methods** None required—this product is not readily flowable
- Cleaning Methods** Collect liquid in a sealable container. Sprinkle inert absorbent compound onto spill, then sweep into the container. Wipe remaining 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.
- RECOMMENDATION:** Use a plastic, stainless steel, or carbon steel container. Avoid containers with copper, aluminum, zinc, or galvanized surfaces since the waste mater can slowly oxidize them.
- Disposal Methods** Dispose spill waste according to Section 13.

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.
 - Contaminated work clothing should not be allowed out of the workplace. Take off contaminated clothing and wash it before reuse.
 - Protect from extreme heat. Do not process in a way that causes mist or fumes.
 - Do not breathe fumes/vapors.
 - Do not eat, drink, or smoke when using this product.
 - Avoid release to the environment.
- Handling**
- Wear protective gloves/eye protection.
 - Wash hands thoroughly after handling.
 - Collect spillage.
- Storage**
- Keep container tightly closed.
 - Store locked up.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
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 (<i>metal dust, mist</i>) (<i>metal</i>) (<i>Ag and its compounds</i>) (<i>metal, dust, fumes</i>)	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	3 mg/m ³	Not established	
diethylene triamine	ACGIH	1 ppm ^{a)}	Not established
	U.S.A. OSHA PEL	Not established	Not established
	Canada AB	1 ppm ^{a)}	Not established
	Canada BC	1 ppm ^{a), b)}	Not established
	Canada ON	1 ppm ^{a)}	Not established
Canada QC	1 ppm ^{a)}	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.

a) Danger of cutaneous absorption

b) Skin sensitizer

Engineering Controls
Ventilation

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

Because the silver flakes and diethylene triamine are bound in the adhesive mixture, they do not present an airborne hazard under normal use. Ensure adequate ventilation if the product is mechanically misted or aerosolized.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B**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 dust/mist/vapors/fumes, wear respirator such as a half-mask respirator with organic vapor cartridges and particulate filter.

Above 10 x OEL or if the worker is allergic, use a full mask, 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, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
Section 9: Physical and Chemical Properties

Physical State	Solid, paste	Lower Flammability Limit	Not available
Appearance	Silver grey	Upper Flammability Limit	Not available
Odor	Amine-like	Vapor Pressure @25 °C	Not available
Odor Threshold	Not available	Vapor Density	Not available
pH	Not available	Specific Gravity @25 °C	2.4
Freezing/Melting Point	Not available	Solubility in Water	Practically insoluble
Boiling Point	Not available	Partition Coefficient	Not available
Flash Point ^{a)}	>93.3 °C [>200 °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) Setaflashed closed cup for hardener components

Section 10: Stability and Reactivity

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

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
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. Contains mechanically abrasive particles.
Skin	May cause redness, serious skin irritation, allergic contact dermatitis, and chemical burns.
Inhalation	May cause cough and severe respiratory irritation.
Ingestion	May cause severe irritations or burns to mouth, throat, and stomach (see inhalation symptoms).
Chronic	<p>Prolonged and repeated exposure may lead to skin sensitization and to reproductive toxicity.</p> <p>Long term exposure to silver powder or compounds can lead to an irreversible blue-grey discoloration of the skin.</p>

Lethal Exposure Concentrations

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation
silver	>5 g/kg Guinea Pig	>2 000 mg/kg Rabbit	5.16 mg/L Rat ≥4 h (dust)
4-nonyl phenol, branched	1 300 mg/kg Rat	>3 160 mg/kg	Not established
1-piperazineethanamine	2 140 µl/kg Rat	866 mg/kg Rabbit	Not established
diethylene triamine, reaction product with diglycidyl ether of Bisphenol A	Not established	Not established	Not established
diethylene triamine	1 080 mg/kg Rat	1 090 mg/kg Rabbit	Not established
4,4'-isopropylidenediphenol	2 400 mg/kg Rat	3 mL/kg Rabbit	>170 mg/m ³ Rat 6 h

Note: Toxicity data from the RTECS database accessed through the Canadian Centre for Occupational Health and Safety (CCOHS)² were consulted. The data from supplier (M)SDS were also consulted.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B**Other Toxicological Effects****Skin corrosion/irritation**

The 4-nonyl phenol, branched; diethylene triamine; and 1-piperazineethanamine cause skin burns.

Serious eye damage/irritation

The 4-nonyl phenol, branched; diethylene triamine; and 1-piperazineethanamine cause eye damage.

Respiratory and skin sensitization (allergic reactions)

The 1-piperazineethanamine and 4,4'-isopropylidenediphenol may cause skin sensitization.

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.

Reproductive Toxicity
(risk to sex functions)

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

Teratogenicity
(risk of fetus malformation)

The 4-nonyl-phenol, branched and 4,4'-isopropylidenediphenol are suspected of being a reproductive toxicants.

STOT-single exposure

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

STOT-repeated exposure

No known classifiable effects. See hazards not otherwise specified Argiria warning in Section 2.

Aspiration hazard

Based on available data, the classification criteria are not met. The Mixture does not contain components classified as aspiration hazards and the kinematic viscosity of the mixture 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 EU48 regulators. The classification that follows takes into account to chronic aqueous toxicity of category 1 (M = 10 for silver) of the EU.

The 4-nonyl phenol, branched, ingredient has a chronic aqueous toxicity of category 1 according to the minimal LC50 96 h of 0.135 mg/L *Lepomis macrochiru*.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B

The 4,4'-isopropylidenediphenol ingredient is a Cat 2 aqueous pollutant according to the minimal 96 h LC50 of 4.6 mg/L for Pimephales promelas (fathead minnow); EC50 48 h of 10.2 mg/L Daphnia Magna (water flea); and EC50 96 h of 2.73 for Pseudokirchneriella subcapitata (green algae).

The 1-piperazineethanamine (CAS# 140-31-8) is a Cat 4 aqueous pollutant according to the minimal 96 h LC50 of 2190 mg/L for Pimephales promelas (fathead minnow); EC50 48 h of 58 mg/L Daphnia Magna (water flea); EC50 72 h of 465 mg/L for Selenastrum capricornutum.

Diethylene triamine (CAS# 90-72-2) is not classified as an aqueous pollutant according to available data.

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

Not available

Bioaccumulative Potential

Not available

Mobility in Soil

Not available

Other Effects

Not available

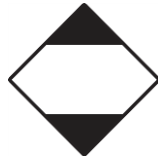
Section 13: Disposal Considerations

Dispose of contents in accordance with all local, regional, national, and international regulations.

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
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: UN3263

Shipping Name:

 CORROSIVE SOLID, BASIC, ORGANIC
 N.O.S. (4-nonyl phenol, branched; amino-
 ethylpiperazine; silver powder < 1 mm)

Class: 8

Packing Group: II

Marine Pollutant: Yes

 Flash Point ≥ 93.3 °C [≥ 200 °F]

Air

Refer to ICAO-IATA Dangerous Goods Regulations.

Sizes 30 g and under

Excepted Quantity

 Document as class **E2**


Sizes greater than 1 kg up to 15 kg

UN number: UN3263

Shipping Name:

 CORROSIVE SOLID, BASIC, ORGANIC
 N.O.S. (4-nonyl phenol, branched; amino-
 ethylpiperazine; silver powder < 1 mm)

Class: 8

Packing Group: II

Marine Pollutant: Yes

 Flash Point ≥ 93.3 °C [≥ 200 °F]


Sizes 1 kg and under

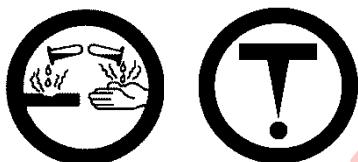
Limited Quantity
Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B
Sea

Refer to IMDG regulations.	
Sizes 30 g and under Excepted Quantity Document as class E2 Sizes 1 kg and under Limited Quantity	Sizes greater than 1 kg UN number: UN3263 Shipping Name: CORROSIVE SOLID, BASIC, ORGANIC N.O.S. (4-nonyl phenol, branched; amino-ethylpiperazine; silver powder < 1 mm) Class: 8 Packing Group: II Marine Pollutant: Yes Flash Point ≥ 93.3 °C [≥ 200 °F]



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

Section 15: Regulatory Information
Canada
WHMIS 1988 Classification


E – Corrosive Material;

D2A – Very Toxic Material (Reproductive Toxicity);

D2B – Toxic Material (Skin Sensitization in Humans)

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.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B**USA****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.

This product contains 4,4'-isopropylidenediphenol (CAS# 80-05-7), which is subject to the reporting requirements of section 313 of the SARA Title III.

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 22 June 2015

Supersedes 14 January 2013

Reason for Changes: Reevaluation based on new toxicological data and reformatting to better meet HCS 2012 and WHMIS 2015 information requirements.

Section continued on the next page

SILVER CONDUCTIVE EPOXY, MODERATE CURE/HIGH CONDUCTIVITY 8331-PART B**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
GHS	Globally Harmonized System of Classification of Labeling of Chemicals
IARC	International Agency for Research on Cancer
LC50	Lethal Concentration 50%
LD50	Lethal Dose 50%
NTP	National Toxicology Program
OEL	Occupational Exposure Limit
PEL	Permissible Exposure Limit
SDS	Safety Data Sheet
STEL	Short-Term Exposure Limit
TCLo	Lowest published toxic concentration
TWA	Time Weighted Average
VOC	Volatile Organic Content

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