

SLOW CURE THERMAL CONDUCTIVE ADHESIVE

8329TCS-PART A

# Safety Data Sheet

## Section 1: Product and Company Identification

**Product Name:** Slow Cure Thermal Conductive Adhesive**MSDS Code:** 8329TCS-Part A**Related Part #:** 8329TCS-6ML, 8329TCS-200ML**Use:** Thermally electrically conductive adhesive for bonding and thermal management**Emergency Contact**CHEMTREC ☎: 1-800-424-9300 (**For hazardous material incidents ONLY**—leaks, spills, fires, exposures or accidents)**Manufacturer:** MG Chemicals (Head Office), 9347-193 Street, Surrey, B.C., V4N 4E7**Technical Contacts:** ☎ 1-800-201-8822 **FAX** 1-800-708-9888**E-MAIL:** [support@mgchemicals.com](mailto:support@mgchemicals.com) **WEB** [www.mgchemicals.com](http://www.mgchemicals.com)

## Section 2: Hazards Identification



**WHMIS Classification**

D2B – Toxic Material (Skin/Eye Irritation; Skin Sensitization in Humans)

**GHS Pictograms**Signal Word  
WARNING*Continued on the next page*

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A**

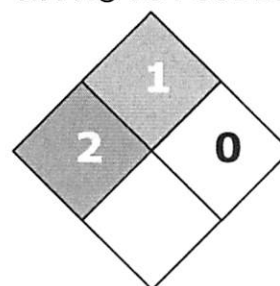
**GHS Categories**

Criteria		Category	Signal Word	Pictograms
Sensitization	Skin sensitizer	1	Warning	
Skin Irritation		2A	Warning	
Eye Irritation		2	Warning	
Environmental Hazard	Chronic Aqua. Tox.	1	Warning	
Environmental Hazard	Acute Aqua. Tox.	1	Warning	

**HMIS® RATING**

<b>HEALTH:</b>	<b>2</b>
<b>FLAMMABILITY:</b>	<b>1</b>
<b>PHYSICAL HAZARD:</b>	<b>0</b>
<b>PERSONAL PROTECTION:</b>	

**NFPA® 704 CODES**



*Approximate HMIS and NFPA Risk Ratings Legend:*

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

**Physical Hazards**

*GHS Code: Hazard Statement*  
none

**Health Hazards**

*GHS Code: Hazard Statement*  
H319: Causes serious eye irritation  
H315: May cause skin irritation  
H317: May cause allergic skin reaction

**Environmental Hazards**

*GHS Code: Hazard Statement*  
H410: Very toxic to aquatic life with long lasting effects

*Continued on the next page*

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Other Hazards**

When the product is exposed to very high heat, this may cause harmful zinc oxide and aluminum oxide fumes. Inhalation of fumes may cause metal fever and irritate the respiratory tract. The flu-like symptoms of metal fume fever may be delayed, occurring 4–12 hours after exposure. Repeated or prolonged exposure to aluminum oxide fumes may also lead to staining, pulmonary fibrosis (lung scarring), and pneumoconiosis (reaction to the deposition of dust in the lungs).

**Exposure Routes and Symptoms Summary**

**Eyes** Causes serious eye irritation. The adhesive contains mechanically abrasive particles. May also cause eye redness or pain.

**Skin** May cause mild to moderate skin irritation and allergic skin reactions.

**Inhalation** *Not a likely route of exposure.* May cause nose, throat and lung irritation. Fumes or gases from product when heated to extreme temperatures can cause metal fume fever and toxic gas emissions.

**Ingestion** *Not a likely route of exposure.* No acute toxicity effect known. May cause irritation. May cause allergic reactions.

**Chronic** Prolonged or repeated exposure to the uncured epoxy resins used may cause dermatitis and sensitization.

Prolonged or repeated exposure to aluminum oxide particles may lead to long scarring and reaction to dust deposition in the lungs.

**Section 3: Hazardous Ingredients**

CAS #	Chemical Name	Wt%
1344-28-1	aluminum oxide	15–40%
1314-13-2	zinc oxide	15–40%
28768-32-3	4,4'-Methylenebis[N,N-bis(2-oxiranylmethyl)aniline]	10–30%
28064-14-4	epoxy phenol novolac resin	5–10%
10043-11-5	boron nitride	1–5%
17557-23-2	1,3-bis(2,3-epoxypropoxy)-2,2-dimethyl-propane	1–5%
1333-86-4	carbon black	0.1–1%

*Note:* Limits from by RTECS database of the Canadian Centre for Occupational Health and Safety (CCOHS).<sup>1</sup> Data from suppliers' MSDS were also consulted. Specific percentages are being withheld as trade secrets.

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE****8329TCS-PART A****Section 4: First Aid Measures**

<i>Exposure Condition</i>	<i>GHS Code; Precautionary Statement</i>
<b>IF IN EYES</b>	P305
<b>Symptoms</b>	Immediate: <i>irritation, redness, pain</i>
<b>Response</b>	P351: Rinse cautiously with water for several minutes. P338: Remove contact lenses, if present and easy to do. Continue rinsing.
<b>If eye irritation persists</b>	P313: Get medical attention.
<b>IF ON SKIN</b>	P302
<b>Symptoms</b>	Immediate: <i>irritation, redness;</i> Delayed: <i>dry skin, rash</i>
<b>Response</b>	P352: Wash with plenty of water. P362+ P364 + P272: Take off contaminated clothing and wash it before reuse. Contaminated work clothing should not be allowed out of the workplace.
<b>If skin irritation, rash occurs, or concerned</b>	P313: Get medical advice/attention.
<b>IF INHALED</b>	P304 ( <i>Not a likely route of exposure under normal use</i> )
<b>Symptoms</b>	Immediate: <i>cough, sore throat, respiratory system irritation</i> Delayed: <i>fever, nausea, asthma</i>
<b>Response</b>	P340: Remove person to fresh air (out of the contaminated zone) and keep comfortable for breathing.
<b>If feeling unwell</b>	P312: Call a POISON CENTRE/doctor.
<b>IF SWALLOWED</b>	P301 ( <i>Not a likely route of exposure under normal use</i> )
<b>Symptoms</b>	Immediate: <i>irritation</i>
<b>Response</b>	P330: Rinse mouth. P331: Do NOT induce vomiting.
<b>If feeling unwell</b>	P312: Call a POISON CENTRE/doctor.

*Note:* GHS codes and corresponding precaution statements are used when available.

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Section 5: Fire Fighting Measures**

<b>Autoignition Temperature</b>	Not Established	<b>Flash Point</b> <sup>a)</sup>	>149 °C [>300 °F]	<b>LFL [LEL]<sup>b)</sup></b> <b>UFL [UEL]</b>	Not Established
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**In case of fire** P370

**Response** P378: Use dry chemical, carbon dioxide, or chemical foam to extinguish. Use water spray to cool containers.

**Note:** Water or foam may cause frothing.

**Combustion Products** Produces CO, CO<sub>2</sub>, boron oxides, nitrogen oxides, toxic fumes, and smoke.

**Fire-Fighter** Wear self-contained breathing apparatus for fire fighting

**General Information** Toxic metal fumes may be released in fire. Prevent fire-fighting wash from entering waterway or sewer system.

*Note:* The GHS codes and the GHS precaution statements are used. The format is  
*GHS Codes: Statements.*

a) Closed cup value for the epoxy phenol novolac resin component.

b) LFL = Lower Flammability [or Explosion] Limit (in volume %);

UFL = Upper Flammability [or Explosion] Limit (in volume %)

**Section 6: Accidental Release Measures**

**Personal Protection:** See Section 8. Avoid breathing the mist/vapors.

**Containment** Remove all sources of ignition.

**Cleaning** Collect liquid in a sealable, solvent-resistant container. Sprinkle inert absorbent compound onto spill, then sweep into the container. Wipe up further residue with 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.

**Disposal** Dispose of spill waste according to Section 13.

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE**
**8329TCS-PART A**
**Section 7: Handling and Storage**

**Prevention** P262: Do not get in eye, on skin, or on clothing.

P261 + P271 + P284: Avoid breathing fume/vapors. Use only outdoors or in well ventilated area. In cases of inadequate ventilation wear respiratory protection.

P270: Do not eat, drink, or smoke when using this product.

**Handling** P280: Wear protective gloves/clothing/eye protection.

P264: Wash hands thoroughly after handling.

**Storage** P403 + P233+ P235: Keep Container tightly closed. Store in a well-ventilated area. Keep cool.

**RECOMMENDATION:** Keep in a dry and clean area, away from incompatible substances.

*Note:* The GHS codes and the GHS precaution statements are used.

**Section 8: Exposure Controls/Personal Protection**
**Routes of Entry**

Eyes, ingestion, inhalation, and skin

**Substances with Occupational Exposure Limit Values**

Chemical Name	Country	Long Term Exposure Limits		Short Term Exposure Limits (STEL)
		ACGIH TWA	OSHA PEL	
aluminum oxide (dust/mist)	U.S.	1 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> <sup>a)</sup>	—
	Canada	"	15 mg/m <sup>3</sup> <sup>a)</sup>	—
zinc oxide (dust/mist)	U.S.	2 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
	Canada	"	2 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
carbon black	U.S.	3.5 mg/m <sup>3</sup>	3.5 mg/m <sup>3</sup>	—
	Canada	"	—	—

*Note:* Ingredients are listed in descending weight contribution order (from greatest to least). The ACGIH<sup>2</sup>, OSHA, and Canadian provinces exposure limits were consulted. Limits from by RTECS database<sup>1</sup> 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.

a) Total dust limit allowed

b) Respirable airborne particles

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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Engineering Controls****Ventilation**

Keep airborne concentrations below exposure limits. Please note that the aluminum oxide, zinc oxide, and carbon black are inextricably bound to the adhesive mixture; therefore, they are not available as airborne hazard under normal or foreseeable condition of use.

**RECOMMENDATION:** If the product is heated at high temperatures or worker is allergic, 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**

Wear appropriate protective clothing to prevent skin contact.

**RECOMMENDATION:** Use of protective gloves in butyl rubber, latex, neoprene, or other chemically resistant gloves.

**Respiratory Protection**

If exposed to mist, wear respirator such as a half-mask respirator.

**RECOMMENDATION:** Consult your local safety supply store to ensure your respirator has filter cartridges appropriate for the ingredients listed in section 3 of this MSDS, 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.



**SLOW CURE THERMAL CONDUCTIVE ADHESIVE**
**8329TCS-PART A**
**Section 9: Physical and Chemical Properties**

<b>Physical State</b>	Liquid	<b>Odor</b>	Slight	<b>Odor Threshold</b>	Not established
<b>Appearance</b>	Dark grey	<b>Specific Gravity</b>	2.41	<b>Freezing Point</b>	Not established
<b>Boiling Point</b>	Not established	<b>Vapor Pressure @ 20 °C</b>	Not established	<b>Evaporation Rate</b>	Not established
<b>Autoignition Temperature</b>	Not established	<b>Flash Point<sup>a)</sup></b>	>149°C [>300 °F]	<b>Vapor Density</b>	Not established
<b>Lower Flammability Limit</b>	Not established	<b>Upper Flammability Limit</b>	Not established	<b>Decomposition Temp.</b>	Not available
<b>Viscosity</b>	Paste	<b>Partition Coefficient</b>	Not established	<b>Solubility in Water</b>	Insoluble
<b>pH</b>	Not available				

a) The closed cup flash point values are based on the epoxy phenol novolac resin component.

**Section 10: Stability and Reactivity**

<b>Stabilities</b>	Chemically stable at normal temperatures and pressures
<b>Conditions to Avoid</b>	Ignition sources, excessive heat, and incompatible substances. Do not use in a way that forms a mist or aerosolize the product.
<b>Incompatibilities</b>	Strong oxidizing agents, strong acids, strong bases, ammonia, ethylene oxide, flax oils, and halogenated compounds.  <i>Note:</i> React with amines.
<b>Polymerization</b>	Will not occur
<b>Decomposition</b>	Will not decompose under normal conditions. For thermal decomposition, see combustion products in Section 5



**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Section 11: Toxicological Information**

<b>Skin corrosion/irritation</b>	Skin irritant
<b>Serious eye damage/irritation</b>	Causes serious eye irritation. Contains mechanically abrasive particles
<b>Sensitization</b> (allergic reactions)	The epoxy resin components (CAS# 28064-14-4, 28768-32-3, 17557-23-2) may cause skin sensitization in humans
<b>Carcinogenicity</b> (risk of cancer)	<p>The mixture is not classifiable as a carcinogen according to OSHA's Directive CPL 2-2.38 nor by WHMIS according to criteria of Section 58 of the CPR.</p> <p>The possibly carcinogenic Carbon Black [1333-86-4] ingredient is inextricably bound in the epoxy paste mixture; therefore, it is not available as an airborne hazard under normal, reasonable, or foreseeable conditions of use.</p> <p>Carbon Black [1333-86-4]</p> <p>IARC Group 2B: Possibly carcinogenic to humans ACGIH A4: Not classified as a human carcinogen CA Prop 65: Listed as a carcinogen NTP: Not listed</p>
<b>Mutagenicity</b> (risk of heritable genetic effects)	No data available
<b>Reproductive Toxicity</b> (risk to sex functions)	No data available
<b>Teratogenicity</b> (risk of fetus malformation)	No data available
<b>STOT-single exposure</b>	No data available
<b>STOT-repeated exposure</b>	No data available
<b>Aspiration hazard</b>	Viscosity at 40 °C is $>>20.5 \text{ mm}^2/\text{s}$ , thus not classified as aspiration hazard.

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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Acute Toxicity (Lethal Exposure Concentrations)**

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation	TCLo inhalation
aluminum oxide	>5,000 mg/kg Rat <sup>a)</sup>	Not established	Not established	Not established
zinc oxide	7,950 mg/kg Rat		2,500 mg/m <sup>3</sup> mouse	
4,4'-Methylenebis[N,N- bis(2-oxiranylmethyl) aniline]	Not established	Not established	Not established	Not established
epoxy phenol novolac resin	Not established	Not established	Not established	Not established
1,3-bis(2,3- epoxypropoxy)-2,2- dimethyl-propane	4,500 mg/kg Rat	Not established	Not established	Not established
boron nitride	>50 g/kg Rat	>20 g/kg Rat	Not established	100 mg/m <sup>3</sup> 4 h 28 w Rat
carbon black	>15 g/kg Rat	>3 g/kg Rabbit	Not established	1.6 mg/m <sup>3</sup> 7 h Rat

Note: Representative toxicity data from by RTECS database of the Canadian Centre for Occupational Health and Safety (CCOHS)<sup>1</sup> data from supplier MSDS were also consulted.  
a) LD50 from supplier MSDS

**Section 12: Ecological Information**

The ecotoxicity of the mixture was estimated by the calculation method using the summation of classified ingredients. The IMDG Code criteria and the raw-material MSDS along with supporting data for the classification of registered substances from the European Chemical Agency database (<http://echa.europa.eu>) were used.

Contains zinc oxide which is an acute and chronic category 1 solid (non-biodegradable, minimal LC50 of 0.042 mg/L) that is harmful to the environment. The 4,4'-methylenebis[N,N-bis(2,3-epoxypropyl)aniline] and epoxy phenol novolac resin are considered a category 2 marine pollutant.

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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Acute Ecotoxicity**

Category 1

*GHS Code: Hazard Statement*

H400: Very toxic to aquatic life

P273: Avoid release to the environment

P391: Collect spillage

**Chronic Ecotoxicity**

Category 1

H410: Very toxic to aquatic life with long lasting effects

**Biodegradability**

The content is not biodegradable.

**Other Effects**

VOC (EPA, WHIMS, and Europe) = 26%

*\*VOC = Regulated Volatile Organic Content***Section 13: Disposal Information**

P501: Dispose of contents in accordance with all local, regional, national, and international regulations.

**Section 14: Transport Information****Ground** - all sizes less than 4 liters**Limited Quantity****Ground** - sizes greater than 4 liters**Refer to TDG regulations** (Canadian Transportation of Dangerous Goods regulations); **USA CFR 49 Regulations** (Parts 100 to 185).**UN number:** UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide; 4,4'-Methylenebis[N,N-bis(2-oxiranylmethyl)aniline]); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes*Continued on the next page*

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART A****Air -**

**Refer to IATA Dangerous Goods Regulations.**

**UN number:** UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide; 4,4'-Methylenebis[N,N-bis(2-oxiranylmethyl)aniline]); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes

**Note:** The 14 g kit uses individual part containers that fall under the E1 30g/30ml inner packaging limit and may be shipped as '**DG in Excepted Quantities**'. Refer to Package Mark 2.6.7.1 in **IATA** for further instruction. Document as Class **E1**.

**Sea -**

**Refer to IMDG regulations.**

**UN number:** UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide; 4,4'-Methylenebis[N,N-bis(2-oxiranylmethyl)aniline]); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes

*Note:* Component supplier SDS transportation sections and labeling were consulted. All involved staff of shipper must be appropriately trained before involvement with the transport of this product, or work under direct supervision of a trained person.

**Section 15: Regulatory Information****Canada****Domestic Substance List (DSL) / Non-Domestic Substance Lists (NDSL)**

All hazardous ingredients are listed on the DSL/NDSL.

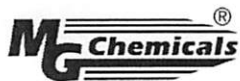
**Industry and Science Canada**

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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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-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 aluminum oxide (CAS# 1344-28-1), 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 contains carbon black (airborne, unbound particles of respirable size), which is listed as a carcinogen.

**Europe**

**RoHS**

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

**WEEE**

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

**Section 16: Other Information**

**MSDS Prepared by** Michel Hachey  
**Date of Issue** 14 January 2013  
**Supersedes** Not applicable  
**Reason for Changes:** New product

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Quality System Certified to ISO 9001:2008

SAI Global File #004008

Burlington, Ontario, Canada

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## **SLOW CURE THERMAL CONDUCTIVE ADHESIVE      8329TCS-PART A**

### **Reference**

- 1) All toxicological data were checked against the RTECS (Registry of Toxic Effects of Chemical Substances®)
- 2) ACGIH 2011 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 (2011).

### **Abbreviations**

ACGIH American Conference of Governmental Industrial Hygienists  
GHS: Globally Harmonized System of Classification of Labeling of Chemicals  
LC50 Lethal Concentration 50%  
LCLo Lowest published lethal concentration  
LD50 Lethal Dose 50%  
N/A Not Applicable  
N/E Not Estimated  
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](http://www.mgchemicals.com).

Email: [support@mgchemicals.com](mailto:support@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.

## SLOW CURE THERMAL CONDUCTIVE ADHESIVE

## 8329TCS-PART B

# Safety Data Sheet

## Section 1: Product and Company Identification

**Product Name:** Slow Cure Thermal Conductive Adhesive**MSDS Code:** 8329TCS-Part B**Related Part #:** 8329TCS-6ML, 8329TCS-200ML**Use:** Thermally electrically conductive adhesive for bonding and thermal management**Emergency Contact**CHEMTREC ☎: 1-800-424-9300 (**For hazardous material incidents ONLY**—leaks, spills, fires, exposures or accidents)**Manufacturer:** MG Chemicals (Head Office), 9347-193 Street, Surrey, B.C., V4N 4E7**Technical Contacts:** ☎ 1-800-201-8822 **FAX** 1-800-708-9888**E-MAIL:** [sds@mgchemicals.com](mailto:sds@mgchemicals.com) **WEB** [www.mgchemicals.com](http://www.mgchemicals.com)

## Section 2: Hazards Identification

**WHMIS Classification**



D2B – Toxic Material (Skin and Eye Irritant; Skin Sensitization in Humans)

**GHS Pictograms**Signal Word  
WARNING*Continued on the next page*



**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B**

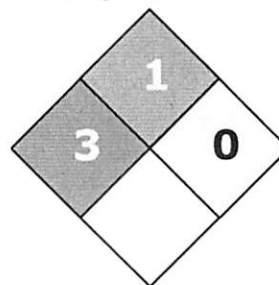
**GHS Categories**

Criteria		Category	Signal Word	Pictograms
Sensitization	Skin sensitizer	1	Warning	
Eye Irritation		2B	Warning	
Skin Irritation		2	Warning	
Environmental Hazard	Chronic Aqua. Tox.	1	Warning	
Environmental Hazard	Acute Aqua. Tox.	1	Warning	

**HMIS® RATING**

<b>HEALTH:</b>	<b>3</b>
<b>FLAMMABILITY:</b>	<b>1</b>
<b>PHYSICAL HAZARD:</b>	<b>0</b>
<b>PERSONAL PROTECTION:</b>	

**NFPA® 704 CODES**



*Approximate HMIS and NFPA Risk Ratings Legend:*

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

**Physical Hazards**

*GHS Code: Hazard Statement*  
none

**Health Hazards**

*GHS Code: Hazard Statement*  
H319: Causes serious eye irritation  
H315: Causes skin irritation  
H317: May cause allergic skin reaction

**Environmental Hazards**

*GHS Code: Hazard Statement*  
H410: Very toxic to aquatic life with long lasting effects

*Continued on the next page*

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B****Other Hazards**

When the product is exposed to very high heat, this may cause harmful zinc oxide and aluminum oxide fumes. Inhalation of fumes may cause metal fever and irritate the respiratory tract. The flu-like symptoms of metal fume fever may be delayed, occurring 4–12 hours after exposure. Repeated or prolonged exposure to aluminum oxide fumes may also lead to staining, pulmonary fibrosis (lung scarring), and pneumoconiosis (reaction to the deposition of dust in the lungs).

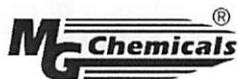
**Exposure Routes and Symptoms Summary**

<b>Eyes</b>	Causes serious eye irritation. The adhesive contains mechanically abrasive particles.
<b>Skin</b>	Causes skin irritation. May cause allergic skin reactions.
<b>Inhalation</b>	<i>Not a likely route of exposure.</i> May be harmful if inhaled. Fumes or gases from product when heated to extreme temperatures can cause metal fume fever and toxic gas emissions.
<b>Ingestion</b>	<i>Not a likely route of exposure.</i> No acute toxicity effect known. May cause irritation to the mouth, throat, esophagus, and stomach. May cause allergic reactions.
<b>Chronic</b>	Prolonged or repeated exposure to the uncured epoxy hardener may cause sensitization (allergies).

**Section 3: Hazardous Ingredients**

<b>CAS #</b>	<b>Chemical Name</b>	<b>Wt%</b>
1344-28-1	aluminum oxide	15–40%
1314-13-2	zinc oxide	15–40%
68541-13-9	Fatty acids, c18-unsat, dimer, polymers, w/3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine	7–13%
68082-29-1	Fatty acids, C18-unsatd., dimers, polymers with tall-oil fatty acids and triethylenetetramine	7–13%
10043-11-5	boron nitride	1–5%
4246-51-9	3,3'-(Oxybis(2,1-ethane-diyloxy))bis-1-propanamine	1–2.3%
108-65-6	2-methoxy-1-methylethyl acetate	0.5–1.5%
1333-86-4	carbon black	0.1–1%
112-24-3	Triethylenetetramine	0.1–0.7%

*Note:* Limits from by RTECS database of the Canadian Centre for Occupational Health and Safety (CCOHS).<sup>1</sup> Data from suppliers' MSDS were also consulted. Specific percentages are being withheld as trade secrets.

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B****Section 4: First Aid Measures**

<i>Exposure Condition</i>	<i>GHS Code: Precautionary Statement</i>
<b>IF IN EYES</b>	P305
<b>Symptoms</b>	Immediate: <i>severe irritation, redness, pain</i>
<b>Response</b>	P351: Rinse cautiously with water for several minutes. P338: Remove contact lenses, if present and easy to do. Continue rinsing.
<b>If eye irritation persists</b>	P310: Get medical advice/attention
<b>IF ON SKIN</b>	P302
<b>Symptoms</b>	Immediate: <i>irritation, redness, pain</i>
<b>Response</b>	P352: Wash with plenty of water. P361: Take off immediately all contaminated clothing. P353 + P362: Wash contaminated clothing before reuse. Contaminated work clothing should not be allowed out of the workplace.
<b>If skin irritation or rash occurs</b>	P310: Get medical advice/attention
<b>IF INHALED</b>	P304 ( <i>Not a likely route of exposure under normal use</i> )
<b>Symptoms</b>	Immediate: <i>irritation, cough</i> Delayed: <i>fever, flu-like symptoms</i>
<b>Response</b>	P340: Remove person to fresh air (out of the contaminated zone) and keep comfortable for breathing.
<b>If feeling unwell</b>	P312: Call a POISON CENTRE/doctor
<b>IF SWALLOWED</b>	P301 ( <i>Not a likely route of exposure under normal use</i> )
<b>Symptoms</b>	Immediate: <i>Abdominal pain, irritation, nausea, vomiting, diarrhea</i>
<b>Response</b>	P330: Rinse mouth. P331: Do NOT induce vomiting.
<b>If feeling unwell</b>	P312: Call a POISON CENTRE/doctor

*Note:* GHS codes and corresponding precaution statements are used when available.

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE****8329TCS-PART B****Section 5: Fire Fighting Measures**

<b>Autoignition Temperature</b>	Not Established	<b>Flash Point</b> <sup>a)</sup>	>93 °C [>199 °F]	<b>LFL [LEL]<sup>b)</sup></b> <b>UFL [UEL]</b>	Not Established
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**In case of fire** P370

**Response** P378: Use dry chemical, carbon dioxide, or chemical foam to extinguish. Use water spray to cool containers.

**Combustion Products** Produces CO, CO<sub>2</sub>, nitrogen oxides, boron oxides, hydrogen sulfides, toxic fumes, and smoke.

**Fire-Fighter** Wear self-contained breathing apparatus for fire fighting

**General Information** Toxic metal fumes may be released in fire. Prevent fire-fighting wash from entering waterway or sewer system.

*Note:* The GHS codes and the GHS precaution statements are used. The format is  
*GHS Codes: Statements.*

a) Closed cup value for the component with the lowest reported boiling point.

b) LFL = Lower Flammability [or Explosion] Limit (in volume %);

UFL = Upper Flammability [or Explosion] Limit (in volume %)

**Section 6: Accidental Release Measures**

**Personal Protection:** See Section 8. Avoid breathing the mist/vapors.

**Containment** Remove all sources of ignition.

**Cleaning** Collect liquid in a sealable, solvent-resistant container. Sprinkle inert absorbent compound onto spill, then sweep into the container. Wipe up further residue with 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.

**Disposal** Dispose of spill waste according to Section 13.



**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B**

**Section 7: Handling and Storage**

**Prevention** P262: Do not get in eye, on skin, or on clothing.

P261 + P271 + P284: Avoid breathing fume/vapors. Use only outdoors or in well ventilated area. In cases of inadequate ventilation wear respiratory protection.

P270: Do not eat, drink, or smoke when using this product.

**RECOMMENDATION:** Protect from high heat. Do NOT process in a fashion that causes mist or fumes.

**Handling** P280: Wear protective gloves/clothing/eye protection.

**RECOMMENDATION:** Wear neoprene, butyl rubber, nitrile or other impervious gloves with breakthrough time greater than intended use period.

P264: Wash hands thoroughly after handling.

**Storage** P403 + P233+ P235: Keep Container tightly closed. Store in a well-ventilated area. Keep cool.

**RECOMMENDATION:** Keep in a dry and clean area, away from incompatible substances.

*Note:* The GHS codes and the GHS precaution statements are used.

**Section 8: Exposure Controls/Personal Protection**

**Routes of Entry**

Eyes, ingestion, inhalation, and skin

*Continued on the next page*

**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B****Substances with Occupational Exposure Limit Values**

Chemical Name	Country	Long Term Exposure Limits		Short Term Exposure Limits (STEL)
		ACGIH TWA	OSHA PEL	
aluminum oxide (dust/mist)	U.S.	1 mg/m <sup>3</sup>	15 mg/m <sup>3</sup> a)	—
	Canada	"	15 mg/m <sup>3</sup> a)	—
zinc oxide (dust/mist)	U.S.	2 mg/m <sup>3</sup>	2 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
	Canada	"	2 mg/m <sup>3</sup>	10 mg/m <sup>3</sup>
carbon black (dust/mist)	U.S.	2 mg/m <sup>3</sup>	—	—
	Canada	"	—	—

**Note:** Ingredients are listed in descending weight contribution order (from greatest to least). The ACGIH<sup>2</sup>, OSHA, and Canadian provinces exposure limits were consulted. Limits from by RTECS database<sup>1</sup> of the Canadian Centre for Occupational Health and Safety (CCOHS) a data from suppliers' SDS were also consulted. Short term exposure limits (STEL) are for 15 min and long term permissible exposure limits (PEL) for 8 h.

a) Total dust limit allowed

b) Respirable airborne particles

**Engineering Controls****Ventilation**

Keep airborne concentrations below exposure limits. Please note that the aluminum oxide, zinc oxide, and carbon black are inextricably bound to the adhesive mixture; therefore, they are not available as airborne hazard under normal or foreseeable condition of use.

**RECOMMENDATION:** If the product is heated at high temperatures or worker is allergic, 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**

Wear appropriate protective clothing to prevent skin contact.

**RECOMMENDATION:** Use of protective gloves in butyl rubber, latex, neoprene, or other chemically resistant gloves.

*Continued on the next page*

## SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B

**Respiratory Protection** If exposed to mist, wear respirator such as a half-mask respirator.

**RECOMMENDATION:** Consult your local safety supply store to ensure your respirator has filter cartridges appropriate for the ingredients listed in section 3 of this MSDS, 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.

### Section 9: Physical and Chemical Properties

<b>Physical State</b>	Liquid	<b>Odor</b>	Ammonia like	<b>Odor Threshold</b>	Not established
<b>Appearance</b>	Medium grey	<b>Specific Gravity</b>	2.28	<b>Freezing Point</b>	Not established
<b>Boiling Point</b>	>210 °C [>200 °F] <sup>a)</sup>	<b>Vapor Pressure @ 20 °C</b>	Not established	<b>Evaporation Rate</b>	Not established
<b>Autoignition Temperature</b>	Not established	<b>Flash Point <sup>a)</sup></b>	>93 °C [>199 °F]	<b>Vapor Density</b>	Not established
<b>Lower Flammability Limit</b>	Not established	<b>Upper Flammability Limit</b>	Not established	<b>Decomposition Temp.</b>	Not available
<b>Viscosity</b>	Paste	<b>Partition Coefficient</b>	Not established	<b>Solubility in Water</b>	Insoluble
<b>pH</b>	Not available				

a) The closed cup flash point and boiling point values are for the component with the lowest reported value.

### Section 10: Stability and Reactivity

<b>Stabilities</b>	Chemically stable at normal temperatures and pressures
<b>Conditions to Avoid</b>	Ignition sources, excessive heat, and incompatible substances. Do not use in a way that forms a mist or aerosolize the product
<b>Incompatibilities</b>	Strong oxidizing agents, peroxides, strong acids, hydrofluoric acid, strong bases, halogenated compounds
<b>Polymerization</b>	Will not occur
<b>Decomposition</b>	Will not decompose under normal conditions. For thermal decomposition, see combustion products in Section 5



**SLOW CURE THERMAL CONDUCTIVE ADHESIVE****8329TCS-PART B****Section 11: Toxicological Information**

<b>Skin corrosion/irritation</b>	Causes skin irritation
<b>Serious eye damage/irritation</b>	Causes serious eye irritation. Contains mechanically abrasive particles
<b>Sensitization</b> (allergic reactions)	The epoxy hardener components (CAS# 4246-51-9, 68082-29-1, and 112-24-3) may cause skin sensitization in humans
<b>Carcinogenicity</b> (risk of cancer)	<p>The mixture is not classifiable as a carcinogen according to OSHA's Directive CPL 2-2.38 criteria or according to WHMIS under Section 58 of the CPR.</p> <p>The possibly carcinogenic Carbon Black [1333-86-4] ingredient is inextricably bound in the epoxy paste mixture; therefore, it is not available as an airborne hazard under normal, reasonable, or foreseeable conditions of use.</p> <p>Carbon Black [1333-86-4]</p> <p>IARC Group 2B: Possibly carcinogenic to humans ACGIH A4: Not classified as a human carcinogen</p> <p>CA Prop 65: Listed as a carcinogen if airborne, unbound particle of respirable size</p> <p>NTP: Not listed</p>
<b>Mutagenicity</b> (risk of heritable genetic effects)	No data available
<b>Reproductive Toxicity</b> (risk to sex functions)	No data available
<b>Teratogenicity</b> (risk of fetus malformation)	No data available
<b>STOT-single exposure</b>	No data available
<b>STOT-repeated exposure</b>	No data available
<b>Aspiration hazard</b>	Viscosity at 40 °C is $>>20.5 \text{ mm}^2/\text{s}$ , thus not classified as aspiration hazard.

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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE****8329TCS-PART B****Acute Toxicity (Lethal Exposure Concentrations)**

<b>Chemical Name</b>	<b>LD50 oral</b>	<b>LD50 dermal</b>	<b>LC50 inhalation</b>	<b>TCLo inhalation</b>
aluminum oxide	>5,000 mg/kg Rat <sup>a)</sup>	Not established	Not established	Not established
zinc oxide	7,950 mg/kg Rat	Not established	2,500 mg/m <sup>3</sup> mouse	Not established
Fatty acids, C18-unsatd... (CAS# 68541-13-9)	Not established	Not established	Not established	Not established
Fatty acids, C18-unsatd... (CAS# 68082-29-1)	Not established	Not established	Not established	Not established
3,3'-(Oxybis(2,1-ethane- diyloxy))bis-1-propanamine	4,310 mg/kg Rat <sup>a)</sup>	2,510 mg/kg Rabbit <sup>a)</sup>	Not established	Not established
Boron nitride	50,000 mg/kg Rat	20 g/kg Rabbit	Not established	Not established
4,4'-Methylenebis (cyclohexylamine)	Not established	Not established	400 mg/m <sup>3</sup> mouse	Not established
carbon black	>15.4 g/kg Rat	>3 g/kg Rabbit	Not established	1.6 mg/m <sup>3</sup> 7 h Rat
Triethylenetetramine	2,500 mg/kg Rat	805 g/kg Rabbit	Not established	Not established

Note: Representative toxicity data from by RTECS database of the Canadian Centre for Occupational Health and Safety (CCOHS)<sup>1</sup> data from supplier MSDS were also consulted.

a) Values from supplier MSDS

**Section 12: Ecological Information**

The ecotoxicity of the mixture was estimated by the calculation method using the summation of classified ingredients. The IMDG Code criteria and the raw-material MSDS along with supporting data for the classification of registered substances from the European Chemical Agency database (<http://echa.europa.eu>) were used.

Contains zinc oxide which is an acute and chronic category 1 solid (non-biodegradable, minimal LC50 of 0.042 mg/L) that is harmful to the environment.

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## **SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B**

### **Acute Ecotoxicity**

Category 1

*GHS Code: Hazard Statement*

H400: Very toxic to aquatic life

P273: Avoid release to the environment

P391: Collect spillage

### **Chronic Ecotoxicity**

Category 1

H410: Very toxic to aquatic life with long lasting effects

### **Biodegradability**

The content is not biodegradable.

### **Other Effects**

VOC (EPA, WHIMS, and Europe) = 26%

*\*VOC = Regulated Volatile Organic Content*

## **Section 13: Disposal Information**

P501: Dispose of contents in accordance with all local, regional, national, and international regulations.

## **Section 14: Transport Information**

**Ground** - all sizes less than 4 liters

**Limited Quantity**

**Ground** - sizes greater than 4 liters

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

**UN number:** UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes

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Burlington, Ontario, Canada

## **SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-PART B**

### **Air -**

**Refer to IATA Dangerous Goods Regulations.**

**UN number:** UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes

**Note:** The 14 g kit uses individual part containers that fall under the E1 30g/30ml inner packaging limit and may be shipped as '**DG in Excepted Quantities**'. Refer to Package Mark 2.6.7.1 in **IATA** for further instruction. Document as Class **E1**.

### **Sea -**

**Refer to IMDG regulations.**

**UN number:** UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes

*Note:* Component supplier SDS transportation sections and labeling were consulted. All involved staff of shipper must be appropriately trained before involvement with the transport of this product, or work under direct supervision of a trained person.

## **Section 15: Regulatory Information**

### **Canada**

#### **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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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE 8329TCS-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 aluminum oxide (CAS# 1344-28-1), 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 contains carbon black (airborne, unbound particles of respirable size), which is listed as a carcinogen.

**Europe****RoHS**

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

**WEEE**

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

**Section 16: Other Information**

**MSDS Prepared by** Michel Hachey

**Date of Issue** 14 January 2013

**Supersedes** Not applicable

**Reason for Changes:** New product

**Reference**

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

2) ACGIH 2011 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 (2011).



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**SLOW CURE THERMAL CONDUCTIVE ADHESIVE      8329TCS-PART B**

**Abbreviations**

ACGIH American Conference of Governmental Industrial Hygienists

GHS: Globally Harmonized System of Classification of Labeling of Chemicals

LC50 Lethal Concentration 50%

LCLo Lowest published lethal concentration

LD50 Lethal Dose 50%

N/A Not Applicable

N/E Not Estimated

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](http://www.mgchemicals.com).

Email: [support@mgchemicals.com](mailto:support@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 ADHESIVE

## 8331S-PART B

# Safety Data Sheet

**Section 1: Product and Company Identification****Product Name:** Silver Conductive Epoxy Adhesive: Slow Cure / High Conductivity**MSDS Code:** 8331S-Part B**Related Part #:** 8331S-15G, 8331S-200ML**Use:** Silver filled electrically conductive adhesive for repairing traces on circuit boards, cold soldering, and bonding**Emergency Contact**CHEMTREC ☎: 1-800-424-9300 (**For hazardous material incidents ONLY**—leaks, spills, fires, exposures or accidents)**Manufacturer:** MG Chemicals (Head Office), 9347-193 Street, Surrey, B.C., V4N 4E7**Technical Contacts:** ☎ 1-800-201-8822 **FAX** 1-800-708-9888**E-MAIL:** [sds@mgchemicals.com](mailto:sds@mgchemicals.com) **WEB** [www.mgchemicals.com](http://www.mgchemicals.com)**Section 2: Hazards Identification****WHMIS Classification**

E – Corrosive Material; D2B – Toxic Material (Skin sensitization in humans)

**GHS Pictograms**Signal Word  
DANGER*Continued on the next page*



**SILVER CONDUCTIVE EPOXY ADHESIVE**

**8331S-PART B**

**GHS Categories**

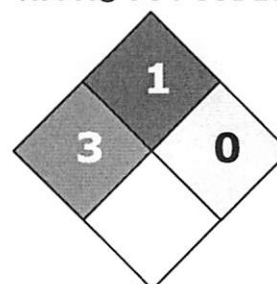
Criteria		Category	Signal Word	Symbol
Eye damage		1	Danger	Corrosion
Sensitization	Skin	1	Warning	Exclamation
Skin irritant		2	Warning	Exclamation
Environmental hazard	Acute aqua. tox.	1	Warning	Environmental
Environmental hazard	Chronic aqua. tox.	1	Warning	Environmental

a) Base on mixture acute toxicity estimate (ATE)

**HMIS® RATING**

<b>HEALTH:</b>	<b>3</b>
<b>FLAMMABILITY:</b>	<b>1</b>
<b>PHYSICAL HAZARD:</b>	<b>0</b>
<b>PERSONAL PROTECTION:</b>	

**NFPA® 704 CODES**



*Approximate HMIS and NFPA Risk Ratings Legend:*

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

**Physical Hazards**

*GHS Code: Hazard Statement*  
none

**Health Hazards**

*GHS Code: Hazard Statement*

H318: Causes serious eye damage

H315: Causes skin irritation

H317: May cause allergic skin reaction

**Environmental Hazards**

*GHS Code: Hazard Statement*

H410: Very toxic to aquatic life with long lasting effects

*Continued on the next page*

**SILVER CONDUCTIVE EPOXY ADHESIVE****8331S-PART B****Exposure Routes and Symptoms Summary**

<b>Eyes</b>	Causes eye damage. The adhesive contains mechanically abrasive particles.
<b>Skin</b>	Causes skin irritation. May cause allergic skin reactions.
<b>Inhalation</b>	May be harmful if inhaled. Material is destructive to the tissue of the mucous membranes and upper respiratory tract.
<b>Ingestion</b>	Harmful if swallowed.
<b>Chronic</b>	Prolonged and repeated exposure to the uncured material used may cause sensitization, asthma, and eczemas.  Long term accumulation of silver can lead to Argyria, which is an irreversible blue-grey discoloration of the skin.

**Section 3: Hazardous Ingredients**

CAS #	Chemical Name	Wt%	ACGIH TWA	OSHA PEL	STEL
7440-22-4	silver	40-70%	0.1 mg/m <sup>3</sup>	0.01 mg/m <sup>3</sup>	Not Established
68541-13-9	9,12-octadecadienoic acid-based polyamidoamine	10-30%	Not Established	Not Established	Not Established
68082-29-1	Fatty acid- polyethylamine polymer	10-30%	Not Established	Not Established	Not Established
4246-51-9	3,3'-(oxybis(2,1- ethane-diyloxy))bis-1- propanamine	1-5%	Not Established	Not Established	Not Established
112-24-3	triethylenetetramine	0.5-1.5%	Not Established	Not Established	Not Established

*Note:* Limits from by RTECS database of the Canadian Centre for Occupational Health and Safety (CCOHS). Data from suppliers' MSDS were also consulted.