

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE **8329TCM-PART A**

Safety Data Sheet

Section 1: Product and Company Identification

Product Name: Medium Cure Thermal Conductive Adhesive

MSDS Code: 8329TCM-Part A

Related Part #: 8329TCM-6ML, 8329TCM-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 **WEB** 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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A

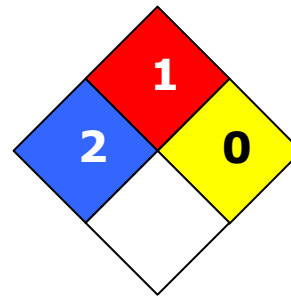
GHS Categories

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

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)

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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	30–60%
1314-13-2	zinc oxide	15–40%
25068-38-6	reaction products: bisphenol-A-(epichlorhydrin) and epoxy resin average MW \leq 700	10–30%
28064-14-4	epoxy phenol novolac resin	7–13%
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).¹ Data from suppliers' MSDS were also consulted. Specific percentages are being withheld as trade secrets.

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A

Section 4: First Aid Measures

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

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A

Section 5: Fire Fighting Measures

Autoignition Temperature	Not Established	Flash Point ^{a)}	>149 °C [>300 °F]	LFL [LEL] ^{b)} UFL [UEL]	Not Established
---------------------------------	-----------------	----------------------------------	----------------------	--	-----------------

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 ₂ , nitrogen oxides, boron 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.

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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 ³	15 mg/m ³ a)	—
	Canada	"	15 mg/m ³ a)	—
zinc oxide (dust/mist)	U.S.	2 mg/m ³	2 mg/m ³	10 mg/m ³
	Canada	"	2 mg/m ³	10 mg/m ³
carbon black	U.S.	3.5 mg/m ³	3.5 mg/m ³	—
	Canada	"	—	—

Note: Ingredients are listed in descending weight contribution order (from greatest to least). The ACGIH², OSHA, and Canadian provinces exposure limits were consulted. Limits from by RTECS database¹ 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

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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.

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A

Section 9: Physical and Chemical Properties

Physical State	Liquid	Odor	Slight	Odor Threshold	Not established
Appearance	Dark grey	Specific Gravity	2.48	Freezing Point	Not established
Boiling Point	Not established	Vapor Pressure @ 20 °C	Not established	Evaporation Rate	Not established
Autoignition Temperature	Not established	Flash Point^{a)}	>149°C [>300 °F]	Vapor Density	Not established
Lower Flammability Limit	Not established	Upper Flammability Limit	Not established	Decomposition Temp.	Not available
Viscosity	Paste	Partition Coefficient	Not established	Solubility in Water	Insoluble
pH	Not available				

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

Section 10: Stability and Reactivity

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A**Section 11: Toxicological Information**

Skin corrosion/irritation	Skin irritant
Serious eye damage/irritation	Causes serious eye irritation. Contains mechanically abrasive particles
Sensitization (allergic reactions)	The epoxy resin components (CAS# 25068-38-6, 28064-14-4, 17557-23-2) may cause skin sensitization in humans
Carcinogenicity (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>
Mutagenicity (risk of heritable genetic effects)	No data available
Reproductive Toxicity (risk to sex functions)	No data available
Teratogenicity (risk of fetus malformation)	No data available
STOT-single exposure	No data available
STOT-repeated exposure	No data available
Aspiration hazard	Viscosity at 40 °C is >>20.5 mm ² /s, thus not classified as aspiration hazard.

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A

Acute Toxicity (Lethal Exposure Concentrations)

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation	TCLo inhalation
aluminum oxide	>5,000 mg/kg Rat ^{a)}	Not established	Not established	Not established
zinc oxide	7,950 mg/kg Rat		2,500 mg/m ³ mouse	
reaction products: bisphenol-A-(epichlorhydrin) and epoxy resin	11,400 mg/kg Rat	Not established	Not established	Not established
epoxy phenol novolac resin	Not established	Not established	Not established	Not established
boron nitride	>50 g/kg Rat	>20 g/kg Rat	Not established	100 mg/m ³ 4 h 28 w Rat
1,3-bis(2,3-epoxypropoxy)-2,2-dimethyl-propane	4,500 mg/kg Rat	Not established	Not established	Not established
carbon black	>15 g/kg Rat	>3 g/kg Rabbit	Not established	1.6 mg/m ³ 7 h Rat

Note: Representative toxicity data from by RTECS database of the Canadian Centre for Occupational Health and Safety (CCOHS)¹ 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 reaction products: bisphenol-A-(epichlorhydrin) and epoxy resin average MW ≤700 is considered a category 2 marine pollutant.

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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; reaction products of bisphenol-A-[epichlorhydrin] and epoxy resin number average molecular weight ≤ 700 ; epoxy phenol novolac resin); **Class:** 9, **Packing Group:** III, Marine Pollutant: Yes*Continued on the next page*

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART A**Air -**

Refer to IATA Dangerous Goods Regulations.

UN number: UN3077; **Shipping Name:** ENVIRONMENTALLY HAZARDOUS SUBSTANCE LIQUID, N.O.S. (Zinc oxide; reaction products: bisphenol-A-(epichlorhydrin) and epoxy resin (number average molecular weight ≤ 700 ; epoxy phenol novolac resin); **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; reaction products of bisphenol-A-(epichlorhydrin) and epoxy resin (number average molecular weight ≤ 700 ; epoxy phenol novolac resin); **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.

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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.

Email: support@mgchemicals.com

Mailing Addresses *Manufacturing & Support*
1210 Corporate Drive
Burlington, Ontario, Canada
L7L 5R6

Head Office
9347-193rd Street
Surrey, British Columbia, Canada
V4N 4E7

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.

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE **8329TCM-PART B**

Safety Data Sheet

Section 1: Product and Company Identification

Product Name: Medium Cure Thermal Conductive Adhesive

MSDS Code: 8329TCM-Part B

Related Part #: 8329TCM-6ML, 8329TCM-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)

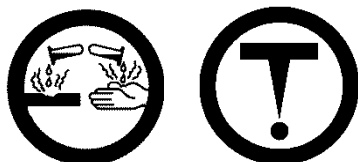
Manufacturer: MG Chemicals (Head Office), 9347-193 Street, Surrey, B.C., V4N 4E7

Technical Contacts: ☎ 1-800-201-8822 FAX 1-800-708-9888

E-MAIL: sds@mgchemicals.com **WEB** www.mgchemicals.com

Section 2: Hazards Identification

WHMIS Classification



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

GHS Pictograms







Signal Word
DANGER

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B

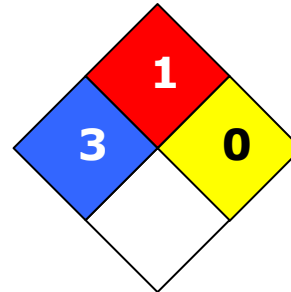
GHS Categories

Criteria	Category	Signal Word	Pictograms
Eye Damage Skin Corrosion/Irritation	1 1B	Danger Danger	
Sensitization Skin sensitizer	1	Warning	
Reproductive Toxicity	2	Warning	
Environmental Hazard Chronic Aqua. Tox.	1	Warning	
Environmental Hazard Acute Aqua. Tox.	1	Warning	

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)

Physical Hazards

GHS Code: Hazard Statement
none

Health Hazards

GHS Code: Hazard Statement

H314: Causes severe skin burns and eye damage

H361: Suspected of damaging fertility or the unborn child

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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

Eyes	Causes severe eye damage. The adhesive contains mechanically abrasive particles.
Skin	Causes skin burns. May cause allergic skin reactions.
Inhalation	<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.
Ingestion	<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.
Chronic	Prolonged or repeated exposure to the uncured epoxy hardener may cause sensitization (allergies).

Section 3: Hazardous Ingredients

CAS #	Chemical Name	Wt%
1344-28-1	aluminum oxide	15–40%
1314-13-2	zinc oxide	15–40%
25154-52-3	Nonylphenol	7–13%
10043-11-5	boron nitride	1–5%
1761-71-3	4,4'-Methylenebis(cyclohexylamine)	1–5%
1333-86-4	carbon black	0.1–1%
112-24-3	Triethylenetetramine	0.1–1%

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B

Section 4: First Aid Measures

<i>Exposure Condition</i>	<i>GHS Code: Precautionary Statement</i>
IF IN EYES	P305
Symptoms	Immediate: <i>irritation, redness, pain, blurred vision, burns</i> , Delayed: <i>eye damage, necrosis, blindness</i>
Response	P351: Rinse cautiously with water for several minutes. P338: Remove contact lenses, if present and easy to do. Continue rinsing. P310: Immediately call a doctor
IF ON SKIN	P302
Symptoms	Immediate: <i>chemical burns, irritation, pain, blisters</i> Delayed: <i>necrosis, scarring</i>
Response	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. P313: Get medical advice/attention
IF INHALED	P304 (<i>Not a likely route of exposure under normal use</i>)
Symptoms	Immediate: <i>irritation, severe irritation, cough</i> Delayed: <i>fever, flu-like symptoms</i>
Response	P340: Remove person to fresh air (out of the contaminated zone) and keep comfortable for breathing.
If feeling unwell	P312: Call a POISON CENTRE/doctor
IF SWALLOWED	P301 (<i>Not a likely route of exposure under normal use</i>)
Symptoms	Immediate: <i>Chemical burns, abdominal pain, irritation, nausea, vomiting, diarrhea</i>
Response	P330: Rinse mouth. P331: Do NOT induce vomiting.
If feeling unwell	P312: Call a POISON CENTRE/doctor

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B

Section 5: Fire Fighting Measures

Autoignition Temperature	Not Established	Flash Point ^{a)}	>222 °C [>432 °F]	LFL [LEL] ^{b)} UFL [UEL]	Not Established
---------------------------------	-----------------	----------------------------------	----------------------	--	-----------------

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 ₂ , 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. Use of water may result in the formation of very toxic aqueous solution that should not be allowed to enter water drains or water courses.

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.

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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 ³	15 mg/m ³ a)	—
	Canada	"	15 mg/m ³ a)	—
zinc oxide (dust/mist)	U.S.	2 mg/m ³	2 mg/m ³	10 mg/m ³
	Canada	"	2 mg/m ³	10 mg/m ³
carbon black (dust/mist)	U.S.	2 mg/m ³	—	—
	Canada	"	—	—

Note: Ingredients are listed in descending weight contribution order (from greatest to least). The ACGIH², OSHA, and Canadian provinces exposure limits were consulted. Limits from by RTECS database¹ 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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-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

Physical State	Liquid	Odor	Amine Like	Odor Threshold	Not established
Appearance	Dark grey	Specific Gravity	2.38	Freezing Point	Not established
Boiling Point	Not established	Vapor Pressure @ 20 °C	Not established	Evaporation Rate	Not established
Autoignition Temperature	Not established	Flash Point^{a)}	>222 °C [>432 °F]	Vapor Density	Not established
Lower Flammability Limit	Not established	Upper Flammability Limit	Not established	Decomposition Temp.	Not available
Viscosity	Paste	Partition Coefficient	Not established	Solubility in Water	Insoluble
pH	Not available				

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

Section 10: Stability and Reactivity

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

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B**Section 11: Toxicological Information**

Skin corrosion/irritation	Causes skin burns. Skin irritant
Serious eye damage/irritation	Causes serious eye damage. Contains mechanically abrasive particles
Sensitization (allergic reactions)	The epoxy hardener component (CAS# 1761-71-3 and 112-24-3) may cause skin sensitization in humans
Carcinogenicity (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>
Mutagenicity (risk of heritable genetic effects)	No data available
Reproductive Toxicity (risk to sex functions)	No data available
Teratogenicity (risk of fetus malformation)	The nonylphenol (CAS# 25154-52-3) component is a suspected human reproductive toxicant based on studies on rats that showed abnormal development LDLo oral doses of 2 mg/kg.
STOT-single exposure	No data available
STOT-repeated exposure	The 4,4'-Methylenebis(cyclohexylamine) ingredient is a category 2 ingredient that may cause damage to the lung and muscle organs through prolonged or repeated exposure. However, since it is present at concentration of less and equal than 5%, it is below the threshold for classification.
Aspiration hazard	Viscosity at 40 °C is >>20.5 mm ² /s, thus not classified as aspiration hazard.

Continued on the next page

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

Chemical Name	LD50 oral	LD50 dermal	LC50 inhalation	TCLo inhalation
aluminum oxide	>5,000 mg/kg Rat ^{a)}	Not established	Not established	Not established
zinc oxide	7,950 mg/kg Rat	Not established	2,500 mg/m ³ mouse	Not established
nonylphenol	589 mg/kg Rat	2,140 mg/kg Rabbit	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 ³ mouse	Not established
carbon black	>15.4 g/kg Rat	>3 g/kg Rabbit	Not established	1.6 mg/m ³ 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)¹ data from supplier MSDS were also consulted.

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 nonylphenol component is also classified category 1 (minimal LC50 0.128 mg/L).

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

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B**Biodegradability**

The content is not biodegradable.

Other Effects

VOC (EPA, WHIMS, and Europe) = 24%

*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: UN2732; **Shipping Name:** AMINES, LIQUID, CORROSIVE, n.o.s. (nonylphenol; 4,4'-Methylenebis(cyclohexylamine)); **Class:** 8, **Packing Group:** III, Marine Pollutant: Yes

Air -

Refer to IATA Dangerous Goods Regulations.

UN number: UN2735; **Shipping Name:** AMINES, LIQUID, CORROSIVE, n.o.s. (nonylphenol; 4,4'-Methylenebis(cyclohexylamine)); **Class:** 8 (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**.

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B**Sea -**

Refer to IMDG regulations.

UN number: UN2735; **Shipping Name:** AMINES, LIQUID, CORROSIVE, n.o.s. (nonylphenol; 4,4'-Methylenebis(cyclohexylamine)); **Class:** 8, **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.

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.

Continued on the next page

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B

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).

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

Continued on the next page



Quality System Certified to ISO 9001:2008

SAI Global File #004008
Burlington, Ontario, Canada

MEDIUM CURE THERMAL CONDUCTIVE ADHESIVE 8329TCM-PART B

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

Email: support@mgchemicals.com

Mailing Addresses *Manufacturing & Support*
1210 Corporate Drive
Burlington, Ontario, Canada
L7L 5R6

Head Office
9347-193rd Street
Surrey, British Columbia, Canada
V4N 4E7

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.