

MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

PRODUCT DESCRIPTION:

RHODIUM PLATING SOLUTIONS

TRADE NAMES (AS LABELED):

This document is applicable to the following Cohler products:

- * Pen Rhodium Concentrate (Pen Pals®)
- * Pen Rhodium Concentrate (0.5 gram, 1 gram, 1 ½ gram, 2 gram, 5 gram, 10 gram, 20 gram)
- * Rhodium Replenisher Concentrate (1 gram, 2 gram, 4 gram, 5 gram, 10 gram, 12 gram)
- * Rhodium Plating Solution Concentrate (1 gram, 2 gram, 5 gram, 8 gram)

The information presented in this document is pertinent to all the above-named products.

CHEMICAL NAMES/CLASS:

Not Applicable

SYNONYMS:

Not Applicable

PRODUCT USE:

Jewelry Plating

SUPPLIER/MANUFACTURER'S NAME:

COHLER ENTERPRISES, INC.

ADDRESS:

101 North Haven Street, Baltimore, MD 21224

EMERGENCY PHONE:

CHEMTREC, 800-424-9300

BUSINESS PHONE:

(410) 342-1400

DATE OF PREPARATION/LAST REVISION

February 14, 2002/May 1, 2005

2. COMPOSITION and INFORMATION ON INGREDIENTS

These products are packaged in 1 ounce to 1 quart containers. The information presented in this document is directed to potential exposure and release situations pertinent to this product's volume.

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR				
			ACGIH		OSHA		OTHER
			TLV mg/m ³	STEL mg/m ³	PEL mg/m ³	STEL mg/m ³	
RHODIUM SULFATE (Soluble rhodium compounds, as Rh)	10489-46-0	0.5-10	0.01; A4♦	NE	0.001	NE	NIOSH IDLH: 2 (as Rh) mg/m ³ NIOSH REL: 0.001 mg/m ³
SULFURIC ACID	7664-93-9	15-60	0.2 (T) A2 ♦	NE	1	NE	NIOSH IDLH: 15 mg/m ³ NIOSH REL: 1 mg/m ³ DFG MAK: 1 mg/m ³ (I); 0.2 mg/m ³ ©)
WATER	7732-18-5	Balance	NE	NE	NE	NE	NE

*Soluble rhodium compounds, as Rh. (T) =Thoracic Fraction of the aerosol. (I) = Inhalable fraction of the aerosol.

♦ACGIH: A2 (Suspected Human Carcinogen; Sulfuric Acid contained in strong inorganic acid mists); A4 (Not Classifiable as a Human Carcinogen).

NE = Not Established. C = Ceiling Level. See Section 16 for definitions of terms used.

NOTE: All WHMIS required information is included. It is located in appropriate sections based on the ANSI Z400.1-1998 format.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

SKIN EXPOSURE: If the product contaminates the skin, immediately begin decontamination with running water. Remove exposed or contaminated clothing, taking care not to contaminate eyes. Victim and rescuers must seek immediate medical attention.

EYE EXPOSURE: If this product enters the eyes, open victim's eyes while under gentle running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing time is 15 minutes.

INHALATION: If vapors, mists, or sprays of this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers.

INGESTION: If this product is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, do not induce vomiting. Victim should drink milk, egg whites, or large quantities of water. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or who cannot swallow.

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take copy of label and MSDS to physician or health professional with victim.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Respiratory problems and cardiovascular illnesses can be aggravated, as well as dermatitis and other skin disorders.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate exposure. For inhalation exposure, observe for possible delayed pulmonary edema.

5. FIRE-FIGHTING MEASURES

FLASH POINT, °C (method): Not applicable.

AUTOIGNITION TEMPERATURE, °C: Not applicable.

FLAMMABLE LIMITS (in air by volume, %):

Lower: Not applicable.

Upper: Not applicable.

FIRE EXTINGUISHING MATERIALS: Use suppression agents appropriate for surrounding areas. Direct fire suppression at burning materials.

Carbon Dioxide: OK Foam: OK Water Spray: OK

Dry Chemical: OK Halon: OK Other: OK

UNUSUAL FIRE AND EXPLOSION HAZARDS: Though not flammable, when heated to decomposition, this product can emit acid mists and toxic gases (including oxides of sulfur and rhodium oxides). This product will generate significant amounts of heat when in contact with water. Contact with many inorganic and organic chemicals can cause potentially vigorous and violent reactions. Sulfuric Acid (a component of this product) is not flammable; in contact with metals, however, it will liberate hydrogen gas that may form an explosive mixture with air.

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural fire fighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, fire-fighters should control run-off water to prevent environmental contamination.



6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a spill, clear the affected area, protect people, and respond with trained personnel.

For small releases, the minimum Personal Protective Equipment should be rubber gloves and rubber apron, splash goggles or safety glasses. In the event a release situation present the potential for inhalation of mists or sprays, respiratory protection should be worn. If necessary, use air-purifying respirator with aid gas cartridges. Refer to next paragraph if oxygen levels are below 19.5% or are unknown.

In case of a non-incident spill, clear the affected area, protect people, and respond with trained personnel. Minimum Personal Protective Equipment should be **Level B: triple-gloves (rubber gloves and nitrile gloves, over latex gloves), chemically resistant suit and boots, hard-hat, and Self Contained Breathing Apparatus (SCBA)**. SCBA should be worn when oxygen levels are below 19.5% or are unknown. Absorb spilled liquid with polypads or other appropriate materials. Decontaminate the area thoroughly by rinsing with soapy water. Use litmus paper to test area and ensure complete decontamination. If necessary, neutralize the area with sodium bicarbonate or other acid-neutralizing. Place all spill residue in a double plastic bag and seal. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations or the requirements of Canada and its Provinces (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Read instructions provided with the product prior to use. Wash hands after handling this product. Do not eat or drink while handling this product. All work practices should minimize the generation of splashes and mists. Remove contaminated clothing and launder prior to reuse.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Always use this product in well-ventilated areas. Ensure containers of this product are properly labeled. Open containers carefully, on a stable surface. Close containers tightly after use. When diluting this solution, slowly add the product to the water, to prevent splattering.

Store containers in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity) and in secondary containment. Inspect all incoming containers before storage, to ensure containers are properly labeled and not damaged. Periodically inspect containers of this product for leaks or damage. Empty containers may contain corrosive liquids or vapors. Therefore, empty containers should be handled with care.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Response) above and in Section 8 (Exposure Controls - Personal Protection). Decontaminate equipment with an acid-neutralizing agent (followed by water rinse) before maintenance begins. Collect all waste materials, including rinsates, and dispose of according to applicable U.S. Federal, State, or local procedures or those of Canada and its Provinces.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation. Use a mechanical fan or vent area to outside. Use a corrosion-resistant exhaust system. Eye-wash/safety shower stations should be near locations in which this product is stored or handled.

RESPIRATORY PROTECTION: Respiratory protection is not normally required for routine use of this product. Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (i.e., an air-purifying respirator with an acid-gas cartridge when mists or sprays can be generated), use only protection authorized in 29 CFR 1910.134 or applicable State regulations. Use supplied air respiratory protection when oxygen levels are below 19.5% or are unknown.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION (Continued)

RESPIRATORY PROTECTION (Continued): The following are the NIOSH respiratory protection guidelines for Rhodium Compounds (soluble):

CONCENTRATION	RESPIRATORY PROTECTION
0.010 mg/m ³ :	Any air-purifying respirator with a high-efficiency particulate filter; supplied air respirator.
0.025 mg/m ³ :	Any supplied-air respirator in continuous-flow mode; any powered, air-purifying respirator with a high-efficiency particulate filter.
0.050 mg/m ³ :	HiEF/PAPRTHiE/SCBA/SAF; Any air-purifying, full-facepiece respirator with a high-efficiency particulate filter; any powered, air-purifying respirator with a high-efficiency particulate filter and a tight face-piece; full facepiece Self Contained Breathing Apparatus; or, Supplied Air Respirator.
2.0 mg/m ³ :	SAF:PD,PP Supplied Air Respirator operated in pressure demand or positive-pressure mode.
Emergency or Planned	Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full facepiece Self Contained Breathing Apparatus; or positive pressure, full facepiece Supplied Air Respirator with an auxiliary positive pressure Self Contained Breathing Apparatus.
Escape:	Any air-purifying respirator with a high-efficiency particulate filter; or escape-type Self Contained Breathing Apparatus.

EYE PROTECTION: Splash goggles or safety glasses should be used for routine operations. Face-shield should be worn when working with more than 1 gallon of this product or during operations in which mists or sprays may be generated.

HAND PROTECTION: Wear neoprene gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

BODY PROTECTION: Rubber apron for routine use.

HMIS PERSONAL PROTECTIVE EQUIPMENT LEVEL: C (gloves, goggles, body protection). Face shields may be needed if splashes/sprays may be generated.

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air=1): Not available.

SPECIFIC GRAVITY (water=1): 1.1-1.6

SOLUBILITY IN WATER: Soluble.

VAPOR PRESSURE, mm Hg @ 20°C: Not available.

ODOR THRESHOLD: Not available.

WATER/OIL DISTRIBUTION COEFFICIENT: Not available.

APPEARANCE AND COLOR: Orange-yellow liquid.

HOW TO DETECT THIS SUBSTANCE (warning properties): An orange-yellow liquid that will turn pH paper red.

EVAPORATION RATE (water 1): Not available.

FREEZING/MELTING POINT: Not available.

BOILING POINT: Not available.

pH: < 1

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: When heated to decomposition, this product can emit acid mists and toxic gases (including oxides of sulfur and rhodium compounds).

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: This product is not compatible with bases, halides, water, cyclopentadiene, cyclopentanone, oxime, nitroaryl amines, hexalithium disilicide, phosphorus(III) oxide, chlorine bromine pentafluoride, trifluoride, and oxygen difluoride (OF₂). Avoid contact with metals. This product can react with water to generate heat.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure to incompatible materials or to extreme heat, as product can decompose, producing acid mists and toxic gases (i.e. sulfur oxides and rhodium compounds).

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Though toxicity data for this product have not been established, the following provides toxicity data on components of this product:

SULFURIC ACID:

Irritant (eye, rabbit) = 1.38 mg; severe effect
Irritant (eye, rabbit) = 100 mg with rinse, severe effect
TCLo (inhalation, rabbit) = 20 mg/m³
TCLo (inhalation, human) = 3 mg/m³/24 weeks
LDLo (unreported, man) = 135 mg/kg

SULFURIC ACID (Continued):

LD₅₀ (oral, rat) = 2140 mg/kg
LC₅₀ (inhalation, rat) = 510 mg/m³/2 hr
LC₅₀ (inhalation, mouse) = 320 mg/m³/2 hr
LC₅₀ (inhalation, guinea pig) = 18 mg/m³

RHODIUM SULFATE: No specific toxicological data are currently available.

SUSPECTED CANCER AGENT: This product does not contain compounds named on the following lists: U.S. FEDERAL OSHA Z LIST, NTP, CAL/OSHA, and therefore the ingredients are not considered to be, or suspected to be, cancer-causing agents by these agencies. Strong inorganic acid mists containing Sulfuric Acid are listed as an IARC Group 1 Carcinogen (Carcinogenic to Humans); they are also listed on the National Toxicology Program as Known to be a Human Carcinogen.

IRRITANCY OF PRODUCT: This product is severely irritating and corrosive to contaminated tissue.

SENSITIZATION TO THE PRODUCT: The components of this product are not known to be sensitizers. Pure rhodium may have the potential to cause sensitization. Prolonged or repeated exposure to rhodium may lead to allergy-like symptoms (rashes, reddening of the skin).

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and its components on the human reproductive system.

Mutagenicity: This product is not reported to produce mutagenic effects in humans.

Embryotoxicity: This product is not reported to produce embryotoxic effects in humans.

Teratogenicity: This product is not reported to produce teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Sulfuric Acid (a component of this product) indicate teratogenic effects.

Reproductive Toxicity: This product is not reported to produce reproductive effects in humans.

BIOLOGICAL EXPOSURE INDICES: Currently there are no Biological Exposure Indices (BEIs) associated with the components of this product.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: This product will react with a wide variety of materials in the environment. The primary effects on plant, aquatic, or animal life would be caused by the low Ph of the material.

EFFECT OF PRODUCT ON PLANTS or ANIMALS: The exact effects depend on the extent of exposure. Lowered pH can be harmful or fatal to animal life.

EFFECT OF PRODUCT ON AQUATIC LIFE: Spills of large amounts of this material into water could lower pH sufficiently to be harmful or fatal to animals or aquatic life in contaminated bodies of water.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Precious metal recovery can be considered as a potential waste-handling option. Otherwise, disposal must be in accordance with appropriate U.S. Federal, State, and local regulations or those of Canada and its Provinces. This chemical, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: D002 (Characteristic, corrosive): applicable to wastes consisting only of this product.

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY THE U.S. DEPARTMENT OF TRANSPORTATION (49 CFR 172.101)

PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic, n.o.s. (Sulfuric Acid, Rhodium Sulfate)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive Material)

UN IDENTIFICATION NUMBER: UN 3264

PACKING GROUP: II

DOT LABEL(S) REQUIRED: Limited Quantity

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER (1996): 154

MARINE POLLUTANT: No component of this product is listed as a marine pollutant by the DOT (49 CFR 172.101, Appendix B).

NOTE: The following Department of Transportation regulations apply specifically to these Cohler products.

Pen Pals and Pen Rhodium Concentrate (0.5 grams): These products are shipped in volumes of less than 30 mL. They therefore meet the requirements for Small Quantity Exception (49 CFR 173.4).

All Other Products: These products are shipped in volumes not over 1 liter. They therefore meet the Limited Quantity Exception for corrosive material (49 CFR 173.154). Per this regulation: *Limited quantities of corrosive materials (Class 8) in Packing Groups II are exempted from labeling, unless offered or intended for transportation by aircraft, and specification packaging requirements when packaged in appropriate combination packagings. In addition, shipments of these limited quantities are not subject to subpart F (Placarding) of part 172. Each package must conform to the packaging requirements of subpart B of this part and may not exceed 30 kg (66 pounds) gross weight. The following combination packagings are authorized: For corrosive materials in Packing Group II, in inner packagings not over 1.0 L (0.3 gallon) net capacity each for liquids or not over 1.0 kg (2.2 pounds) net capacity each for solids, packed in strong outer packagings.*

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS MATERIAL IS CONSIDERED AS DANGEROUS GOODS. Use the above information for the preparation of Canadian shipments.

UPS GUIDE FOR SHIPPING GROUND and AIR HAZARDOUS MATERIALS

PROPER SHIPPING NAME: Corrosive liquid, acidic, inorganic, n.o.s. (Sulfuric Acid, Rhodium Sulfate)

HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive Material)

UN IDENTIFICATION NUMBER: UN 3264

PACKING GROUP: II

DOT LABEL(S) REQUIRED: Ground: Limited Quantity; Air: Corrosive

AIR MAXIMUM NET QUANTITY: 1 Liter

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

SARA REPORTING REQUIREMENTS: The components of this product listed in Section 2 (Composition and Information on Ingredients) are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act.

COMPONENT	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Rhodium Sulfate	Yes	Yes	No
Sulfuric Acid	Yes	Yes	Yes (aerosol forms only)

SARA THRESHOLD PLANNING QUANTITY: Sulfuric Acid = 1000 lb (454 kg)

CERCLA REPORTABLE QUANTITY (RQ): Sulfuric Acid = 1000 lb (454 kg)

TSCA INVENTORY STATUS: The components of this product are listed on the TSCA Inventory.

OTHER U.S. FEDERAL REGULATIONS: Not applicable.

15. REGULATORY INFORMATION (Continued)

STATE REGULATORY INFORMATION: Components of these products are covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and

Hazardous Substances: Sulfuric Acid

California - Permissible Exposure Limits

for Chemical Contaminants: Sulfuric Acid

Florida - Substance List: Sulfuric Acid

Illinois - Toxic Substance List: Sulfuric

Acid

Kansas - Section 302/313 List: Sulfuric

Acid

Massachusetts - Substance List: Sulfuric

Acid

Minnesota - List of Hazardous

Substances: Sulfuric Acid

Missouri - Employer Information/Toxic

Substance List: Sulfuric Acid

New Jersey - Right to Know Hazardous

Substance List: Sulfuric Acid

North Dakota - List of Hazardous

Chemicals and Reportable Quantities:

Sulfuric Acid

Pennsylvania - Hazardous Substance

List: Sulfuric Acid, Rhodium (Soluble

Salts)

Rhode Island - Hazardous Substance

List: Sulfuric Acid

Texas - Hazardous Substance List:

Sulfuric Acid

West Virginia - Hazardous Substance

List: Sulfuric Acid

Wisconsin - Toxic and Hazardous

Substances: Sulfuric Acid

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): No component of this product is on the California Proposition 65 Lists.

LABELING (29 CFR 1910.1200):

SAFETY INFORMATION. DANGER! CAUSES SEVERE BURNS. Contains Sulfuric Acid. For industrial use only. Keep away from Children. See package insert for additional safety information.

ADDITIONAL SAFETY INFORMATION. DANGER! CAUSES SEVERE SKIN AND EYE BURNS. MAY CAUSE BURNS TO RESPIRATORY TRACT. CONTACT WITH WATER CAN GENERATE HEAT. Do not get in eyes, on skin, or clothing. Avoid breathing mist or vapor. Avoid unintentional contact with water. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. **FIRST-AID: In case of contact,** immediately flush eyes or skin with running water for at least 15 minutes while removing contaminated clothing and shoes. **If inhaled:** Remove to fresh air. **If swallowed:** DO NOT induce vomiting. Get medical attention immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person. **For additional aid:** Contact the U.S. Poison Control Center at 1-800-222-1222. **CALL MEDICAL HELP IMMEDIATELY.** Refer to Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: The components of this product are not on the CEPA Priorities Substances Lists

CANADIAN WHMIS SYMBOLS: **D1-B:** Materials Causing Immediate and Serious Toxic Effects

D2-B: Materials Causing Other Toxic Effects/Toxic Material

E: Corrosive Material



16. OTHER INFORMATION

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Cohler Enterprises Inc. assumes no responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Cohler Enterprises, Inc. assumes no responsibility for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

FOR FURTHER INFORMATION: For matters pertaining to the health hazards, safety precautions, environmental compliance issues associated with this product, please contact ADVANCED CHEMICAL SAFETY by calling (858)874-5577 or via email at neal@chemical-safety.com

DATE OF PRINTING:

April 30, 2008

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

SECTION 2: CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching. **ACGIH** - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level. Skin absorption effects must also be considered. **OSHA** - U.S. Occupational Safety and Health Administration. **PEL** - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. The **DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury.

SECTION 3: HAZARDOUS MATERIALS IDENTIFICATION SYSTEM

(HMIS): Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). **Flammability Hazard:** **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). **Physical Hazard:** **0** (normally stable); **1** (material that can become unstable or are otherwise slightly reactive); **2** (materials that are unstable but do not detonate or are otherwise moderately reactive); **3** (materials that can detonate when initiated or are otherwise strongly reactive); **4** (materials that can detonate at normal temperatures or pressures or are otherwise extremely reactive). A special designation is given to indicate the nature of the physical hazard (e.g., oxidizer, water reactive, pyrophoric, compressed gas, organic peroxide, unstable reactive, explosive).

SECTION 5: NATIONAL FIRE PROTECTION ASSOCIATION (NFPA):

Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure could cause death or major residual injury). **Flammability Hazard:** Refer to definitions for "Hazardous Materials Identification System". **Physical Hazard:** **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

FLAMMABILITY LIMITS IN AIR: Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). **Flash Point** - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. **Autoignition Temperature:** The minimum temperature required to initiate combustion in air with no other source of ignition. **LEL** - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. **UEL** - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

SECTION 11: TOXICOLOGICAL INFORMATION: Human and Animal

Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. A **mutagen** is a chemical that causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An **embryotoxin** is a chemical that causes damage to a developing embryo (i.e., within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical that causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance that interferes in any way with the reproductive process. **Other Information:** **BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV.

SECTION 12: Ecological Information:

EC is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. **TL_m** = median threshold limit; Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

SECTION 13: RCRA is the Resource Conservation and Recovery Act.

SECTION 15: This section explains the impact of various laws and regulations on the material. **U.S.:** **EPA** is the U.S. Environmental Protection Agency. **DOT** is the U.S. Department of Transportation. **SARA** is the Superfund Amendments and Reauthorization Act. **TSCA** is the U.S. Toxic Substance Control Act. **CERCLA (or Superfund)** refers to the Comprehensive Environmental Response, Compensation, and Liability Act. Labeling is per the American National Standards Institute Standard: Hazardous Industrial Chemicals - Precautionary Labeling 2000 (**ANSI Z129.1**). **CANADA:** **CEPA** is the Canadian Environmental Protection Act. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **TC** is Transport Canada. **DSL/NDL** are the Canadian Domestic/Non-Domestic Substances Lists.