04-27-04✓
Copper Etching Plates

46902 - 8111
- 8112

REVERE GRAPHICS WORLDWIDE

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

TRADE NAME (AS LABELED):	**COPPER**
CHEMICAL NAME/CLASS:	METAL ALLOY
PRODUCT USE:	Printing Operations
MANUFACTURER'S NAME:	**REVERE GRAPHICS WORLDWIDE**
ADDRESS:	5 Boundary Street Plymouth, MA 02360
EMERGENCY PHONE:	(800) 424-9300 (CHEMTREC)
BUSINESS PHONE:	(508) 746-1000
DATE OF PREPARATION:	May 24, 1995
DATE OF FIRST REVISION:	July 9, 1998

2. COMPOSITION and INFORMATION ON INGREDIENTS

CHEMICAL NAME	CAS #	% w/w	EXPOSURE LIMITS IN AIR BASED ON 8 HOUR TIME-WEIGHTED AVERAGES UNLESS OTHERWISE STATED					
			ACGIH		OSHA			
			TLV mg/m³	STEL mg/m³	PEL mg/m³	STEL mg/m³	IDLH mg/m³	OTHER mg/m³
Copper (exposure limits are for copper fume, dusts, and mists)	7440-50-8	> 99.0	0.2 (fume) 1 (dusts & mists)	NE	0.1 (fume) 1 (dusts & mists)	NE	100	NIOSH REL (fume): 0.1 DFG MAK (fume): 0.1 (Respirable fraction) NIOSH REL: (dusts & mists): 1 DFG MAK (dusts & mists): 1 (Total respirable dust fraction) Carcinogen (copper dusts & mists): EPA-D
Silver	7440-22-4	< 1	0.1	NE	0.01	NE	10	NIOSH REL: 0.01 DFG MAK: 0.01 Carcinogen: EPA-D
Other ingredients present in less than 1% concentration (or 0.1 % for carcinogens, reproductive toxins, and respiratory sensitizers)		Balance	None of these ingredients contributes has established exposure limits or contributes additional, significant hazards. All pertinent hazard information has been presented in the appropriate sections of this document.					
This product has polyethylene film on one side and paint on the other. See Section 7 for handling information.			The information presented in this MSDS is not applicable to these coatings unless otherwise specified.					

NE = Not Established C = Ceiling Limit 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 Z400.1-1993 format.

V-1930

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product is a solid, odorless, copper alloy plate, which has polyethylene film and on one side and paint on the other. There are no immediate health hazards associated with this product. This product is not reactive. If involved in a fire, this product may generate irritating copper fumes and a variety of metal oxides. Emergency responders must wear personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of over-exposure for this product are by skin or eye contact. The following paragraphs describe symptoms of exposure by route of exposure.

INHALATION: Inhalation is not anticipated to be a significant route of overexposure to the plates. Inhalation of large amounts of particulates generated by this product during metal processing operations may be physically irritating and cause deposits of dust in nasal passages. Inhalation of dusts and fumes of Copper (the main component of this product) can cause metal fume fever. Initial symptoms of metal fume fever can include a metallic or sweet taste in the mouth, dryness or irritation of the throat, and coughing. Later symptoms (after 4-48 hours) can include sweating, shivering, headache, fever, chills, thirstiness, muscle aches, nausea, vomiting, weakness, and tiredness. Chronic over-exposure to Copper dust may cause tiredness, stuffiness, diarrhea, and vomiting.

CONTACT WITH SKIN or EYES: Contact of the plate form of this product with the skin is not anticipated to be irritating. Rare cases of allergic contact dermatitis have been reported in people working with copper dust. Contact with the plate form of this product or metal dust generated during routing operations can be physically damaging and irritating to the eye (i.e., foreign object).

SKIN ABSORPTION: Skin absorption is not known to be a significant route of over-exposure for any component of this product.

INGESTION: Ingestion is not anticipated to be a likely route of occupational exposure for this product. If particulates generated during routing operations are ingested (i.e., through poor hygiene practices), nausea, vomiting, diarrhea, and abdominal cramps can occur.

HAZARDOUS MATERIAL INFORMATION SYSTEM

HEALTH	(BLUE)	0
FLAMMABILITY	(RED)	0
REACTIVITY	(YELLOW)	0
PROTECTIVE EQUIPMENT		B

EYES	RESPIRATORY	HANDS	BODY
	See Section 8		See Section 8

For routine industrial applications

See Section 16 for Definition of Ratings

INJECTION: Injection of this product is not anticipated to be a significant route of exposure

TARGET ORGANS: None under normal circumstances of use and handling. Skin, eyes, and respiratory system in situations in which fumes or dusts are generated.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Over-exposure from this product is very unlikely when used for its designed purpose.

ACUTE: Inhalation of large amounts of particulates generated by this product during metal processing operations may result in irritation. Inhalation of dusts and fumes of this product can cause metal fume fever. Contact with the plate form of this product or metal dust generated during routing can be physically damaging and irritating to the eye (i.e., foreign object).

CHRONIC: Rare cases of allergic contact dermatitis have been reported in people working with copper dust. Chronic over-exposure to dusts of this product may cause tiredness, stuffiness, diarrhea, and vomiting. Chronic skin contact or ingestion of dusts, salts, or fumes of Silver, (a component of this product) can result in a condition known as Argyria. This condition is marked by a bluish appearance of the skin and eyes. This effect does not occur as a result of routine use of this product.

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

4. FIRST AID MEASURES

SKIN EXPOSURE: In the event that skin contact leads to irritation, rinse the area thoroughly with water. The contaminated individuals must seek medical attention if any adverse effect persists.

4. FIRST AID MEASURES (Continued)

EYE EXPOSURE: If particulates generated by this product during metal processing operations enter the eyes, open victim's eyes while under gently running water. Use sufficient force to open eyelids. Have victim "roll" eyes. Minimum flushing is for 15 minutes. Victim must seek immediate medical attention.

INHALATION: If particulates generated by this product during metal processing operations are inhaled, remove victim to fresh air. Seek medical attention if any adverse effect occurs after overexposure.

INGESTION: If particulates generated by this product during metal processing operations are 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 unable to 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 health professional with victim.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not applicable.
AUTOIGNITION TEMPERATURE: Not applicable.
FLAMMABLE LIMITS (in air by volume, %): Lower: Not applicable.
Upper: Not applicable.

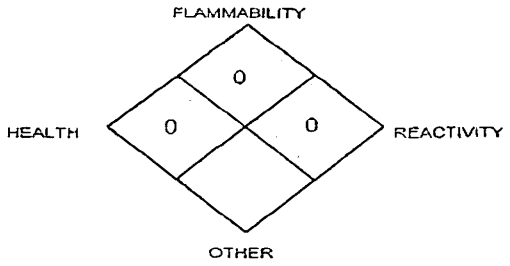
FIRE EXTINGUISHING MATERIALS: Use fire extinguishing materials appropriate for surrounding fire.

Water Spray: Yes	Carbon Dioxide: Yes
Foam: Yes	Dry Chemical: Yes
Halon: Yes	Other: Any "ABC" Class

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this product may decompose and produce irritating fumes and toxic gases including copper oxides, metal fumes, carbon monoxide, and carbon dioxide (from polyethylene film and paint).

Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.

NFPA RATING



See Section 16 for Definition of Ratings

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. If possible, prevent runoff water from entering storm drains, bodies of water, or other environmentally sensitive areas.

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by appropriately trained personnel using pre-planned procedures. Proper protective equipment should be used. If necessary, clear the affected area and protect people. In the event of a non-incidental release of dusts, minimum Personal Protective Equipment should be gloves, goggles, and appropriate body protection. **Level B, which includes the use of Self-Contained Breathing Apparatus, should be worn when oxygen levels are below 19.5% or are unknown.** Pick-up or sweep-up product carefully. Decontaminate the area thoroughly. Place all spill residue in a suitable container and seal if appropriate. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations, or the applicable standards 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 AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after using this product. Do not eat, drink, smoke, or apply cosmetics while handling this product. Avoid breathing dusts of this product. If necessary, periodically wipe-down area of product use to prevent accumulation of dusts. Remove contaminated clothing immediately.

7. HANDLING and STORAGE (Continued)

STORAGE AND HANDLING PRACTICES: All employees who handle this product should be trained to handle it safely. Avoid breathing particulates generated by this product during metal processing or other operations. Use in a well-ventilated location. Packages of this product must be properly labeled.

No special precautions are necessary when handling these plates, except to protect the surfaces from mechanical damage. When removing the polyethylene film, dispose of the plastic properly; it is a low hazard material. If removing the paint coating, use procedures designed to prevent exposure to paint pigments and potentially hazardous components used in the removal process.

Store packages in a cool, dry location. Storage in an atmosphere that is wet, moist, or highly humid may lead to oxidation of this product. Store away from incompatible materials (see Section 10, Stability and Reactivity

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely if necessary. Collect all rinsates and dispose of according to applicable U.S. Federal, State, or local procedures, or the applicable standards of Canada and its Provinces.

8. EXPOSURE CONTROLS -PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients). Prudent practice is to ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed, use only protection authorized in 29 CFR 1910.134 or applicable State regulations. Use supplied air respiration protection if oxygen levels are below 19.5% or are unknown.

EYE PROTECTION: Safety glasses.

HAND PROTECTION: Wear neoprene gloves for routine industrial use.

BODY PROTECTION: Wear body protection appropriate for task (e.g., apron, lab coat, coveralls).

9. PHYSICAL and CHEMICAL PROPERTIES

VAPOR DENSITY (air = 1): Not applicable.
SPECIFIC GRAVITY (water = 1): 8.9
SOLUBILITY IN WATER: Insoluble.
VAPOR PRESSURE, mm Hg @20°C: Not applicable.
ODOR THRESHOLD (recognition): Not applicable.
EVAPORATION RATE (n-BuAc = 1): Not applicable.
MELTING POINT or RANGE: 1083°C (1981°F)
BOILING POINT: Not applicable.
pH: Not applicable.
COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.
APPEARANCE AND COLOR: Flat, copper-colored, photoresist-covered, plate with a black plastic film and pigmented coating on one surface and a green paint on the other.
HOW TO DETECT THIS SUBSTANCE (warning properties): The plate shape is characteristic.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Copper and silver oxides, metal fumes, carbon monoxide, and carbon dioxide.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, strong caustics, strong oxidizers, acetylene.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Fire, extremely high temperatures, contact with incompatible materials.

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

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The specific toxicology data available for components greater than 1% in concentration are as follows.

COPPER:
TDLo - Oral: Human: 120 ug/: Gastrointestinal - nausea or vomiting
LD_{50} - Intraperitoneal - mouse: 3500 ug/kg
TDLo - Intrapleural - rat: 100 mg/kg: Tumorigenic - equivocal tumorigenic agent; Lungs, Thorax, or Respiration - fibrosis, focal (pneumoconiosis), tumors
TDLo - Oral - rat: 152 mg/kg: female 22 week(s) pre-mating: fetotoxicity; Specific Developmental Abnormalities - Central Nervous System

COPPER (continued):
TDLo - Oral - rat: 1520 ug/kg: female 22 week(s) pre-mating: Reproductive - Specific Developmental Abnormalities - musculoskeletal system
TDLo - Oral - rat: 1210 ug/kg: female 35 week(s) pre-mating: Reproductive - Fertility - pre-implantation mortality, post-implantation mortality
TDLo - Intrauterine - rat: 250 ug/kg: female 1 day(s) pre-mating: Reproductive - Maternal Effects - uterus, cervix, vagina; female fertility index

SUSPECTED CANCER AGENT: Silver and Copper (components of this product) are listed as follows:
EPA-D, Not Classifiable as to Human Carcinogenicity.
The other components of this product are not found on the following lists: FEDERAL, OSHA Z LIST, NTP, IARC and CAL/OSHA and therefore are neither considered to be nor suspected to be cancer-causing agents by these agencies.

IRRITANCY OF PRODUCT: This product's fumes or dusts may be irritating to contaminated skin, eyes and respiratory system.

SENSITIZATION TO THE PRODUCT: Rare cases of allergic contact dermatitis have been reported in people working with copper dust.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of this product and their 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 cause teratogenic effects in humans. Studies on test animals exposed to relatively high doses of Copper (a component of this product) indicate adverse teratogenic effects.
Reproductive Toxicity: This product is not reported to cause reproductive effects in humans. Studies on test animals exposed to relatively high doses of Copper (a component of this product) indicate adverse reproductive effects.

A mutagen is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An embryotoxin is a chemical which 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 which causes damage to a developing fetus, but the damage does not propagate across generational lines. A reproductive toxin is any substance which interferes in any way with the reproductive process.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin and respiratory disorders may be aggravated by prolonged over-exposures to the particulates generated by this product during metal processing operations.

RECOMMENDATIONS TO PHYSICIANS: Treat symptoms and eliminate overexposure.

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

12. ECOLOGICAL INFORMATION

ENVIRONMENTAL STABILITY: The components of this product occur naturally in the environment and are expected to persist in the environment for an extended period of time. The components will react with water and air to form a variety of metal oxide compounds. The following environmental data are available for the components of this product.

SILVER: Solubility: Insoluble. Many silver salts are only slightly soluble and so silver cations will rapidly be reduced to lower levels. The Biological half-life for silver is a few days for animals and up to 50 days for humans.
COPPER: Solubility: Insoluble. There is no evidence of any biotransformation for copper compounds. Copper is accumulated by all plants and animals. BCF Algae = 12; plants = 1,000; invertebrate = 1,000, fish = 667 and fish =200(Soluble copper salts).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: The metal components of this product occur naturally in the. This product is not expected to cause adverse effects on plant or animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Under normal circumstances, this product is not expected to cause adverse effects on aquatic life. Low chronic aquatic limits indicate a high chronic hazard, it may be concentrated to toxic levels in food chain. The following aquatic toxicity data are available for the components:

COPPER

12. ECOLOGICAL INFORMATION (Continued)

EFFECT OF CHEMICAL ON AQUATIC LIFE (continued):

COPPER:
LC_{50}(fathead minnows) = 0.14 ppm in hard water
LC_{50}(bluegill) = 0.02 ppm in soft water
LC_{50}(brook trout) = 0.09 ppm in soft water

SILVER: 0.1 ppm is toxic to bacteria and aquatic life. Discharge into marine waters should not exceed /20 of 96 hour LC50, 0.25-0.025 mg/kg/day.

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate U.S. Federal, State, and local regulations, or those of Canada and its Provinces. This product, if unaltered by use, may be disposed of by treatment at a permitted facility or as advised by your local solid waste regulatory authority.

EPA WASTE NUMBER: Waste of this product should be analyzed for Toxicity Characteristic Leaching Procedure chemicals, as follows: D011 (Silver), Regulated Level: 5.0 mg/L.

14. TRANSPORTATION INFORMATION

THIS PRODUCT IS NOT HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME:	Not Applicable
HAZARD CLASS NUMBER and DESCRIPTION:	Not Applicable
UN IDENTIFICATION NUMBER:	Not Applicable
PACKING GROUP:	Not Applicable
DOT LABEL(S) REQUIRED:	Not Applicable
EMERGENCY RESPONSE GUIDE NUMBER:	Not Applicable

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER, 1996: Not applicable.

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

TRANSPORT CANADA TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: THIS PRODUCT IS NOT CONSIDERED AS DANGEROUS GOODS.

15. REGULATORY INFORMATION

U.S. SARA REPORTING REQUIREMENTS: The components of this product are subject to the reporting requirements of Sections 302, 304 and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

CHEMICAL NAME	SARA 302 (40 CFR 355, Appendix A)	SARA 304 (40 CFR Table 302.4)	SARA 313 (40 CFR 372.65)
Copper	No	Yes	Yes
Silver	No	Yes	Yes

U.S. SARA THRESHOLD PLANNING QUANTITY: Not applicable.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Copper = 5000 lb.; Silver = 1,000 lb.; (for metal particles under 100 micrometers in diameter).

U.S. 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)

U.S. STATE REGULATORY INFORMATION: Components of this product are covered under specific State regulations, as denoted below:

Alaska-Designated Toxic and Hazardous Substances: Copper, fume, dust and mist.
California-Permissible Exposure Limits for Chemical Contaminants: Copper, Silver.
Florida-Substance List: Copper fume, dust and mist; Silver.
Illinois-Toxic Substance List: Copper.
Kansas-Section 302/313 List: Copper and compounds.
Massachusetts-Substance List: None.
Michigan-Critical Materials Register: Copper.
Minnesota-List of Hazardous Substances: Copper, fume; Silver,.
Missouri-Employer Information/Toxic Substance List: Copper; Silver.
New Jersey-Right to Know Hazardous Substance List: Copper, Silver.
North Dakota-List of Hazardous Chemicals, Reportable Quantities: Copper, Silver.
Pennsylvania-Hazardous Substance List: Copper, Silver.
Rhode Island-Hazardous Substance List: Copper, fume, dust, mist; Silver.
Texas-Hazardous Substance List: Copper, fume.
West Virginia-Hazardous Substance List: Copper, fume.
Wisconsin-Toxic and Hazardous Substances: Copper, fume.

CALIFORNIA SAFE DRINKING WATER AND TOXIC ENFORCEMENT ACT (PROPOSITION 65): None of the components of this product are on the California Proposition 65 list.

LABELING: CAUTION! PARTICULATES GENERATED FROM THIS PRODUCT MAY CAUSE SKIN AND EYE IRRITATION. PROLONGED SKIN CONTACT WITH DUSTS MAY CAUSE ALLERGIC SKIN REACTIONS. Do not get particulates on skin or in eyes. Avoid prolonged skin contact. Avoid breathing dust or particulates generated by this product. Wear gloves and goggles, as appropriate. FIRST-AID: In case of contact, immediately flush skin or eyes with plenty of water if irritation occurs. If dusts are inhaled, remove to fresh air. If particulates are ingested, do not induce vomiting. Get medical attention if any adverse effect occurs. IN CASE OF FIRE: Use water fog, dry chemical, CO_2, or "alcohol" foam, as appropriate for surrounding materials. IN CASE OF SPILL: Pick-up or sweep-up product. Place in a suitable container and seal. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

CANADIAN DSL/NDSL INVENTORY STATUS: The components of this product are on the DSL or NDSL Inventories

CANADIAN WHMIS SYMBOLS: Not applicable.

16. OTHER INFORMATION

PREPARED BY: CHEMICAL SAFETY ASSOCIATES, Inc.
9163 Chesapeake Drive, San Diego, CA 92123-1002
619/565-0302

DATE OF PRINTING: November 25, 2000

DEFINITIONS OF TERMS

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

CAS # This is the Chemical Abstract Service Number which uniquely identifies each constituent. It is used for computer-related searching.

EXPOSURE LIMITS IN AIR:
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 (C). 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.
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. **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). When no exposure guidelines are established, an entry of NE is made for reference.

HAZARD RATINGS:
HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: 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]. Reactivity 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).
NATIONAL FIRE PROTECTION ASSOCIATION: 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 and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

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.

TOXICOLOGICAL INFORMATION:
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: LD_{50} - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; LC_{50} - 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/m^3 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. Data from several sources are used to evaluate the cancer-causing potential of the material. 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. 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. BEI - 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. Ecological Information: EC is the effect concentration in water.

REGULATORY INFORMATION:
U.S. and CANADA: This section explains the impact of various laws and regulations on the material. EPA is the U.S. Environmental Protection Agency. WHMIS is the Canadian Workplace Hazardous Materials Information System. DOT and TC are the U.S. Department of Transportation and the Transport Canada, respectively. Superfund Amendments and Reauthorization Act (SARA); the Canadian Domestic/Non-Domestic Substances List (DSL/NDSL); the U.S. Toxic Substance Control Act (TSCA); Marine Pollutant status according to the DOT; the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA or Superfund); and various state regulations. This section also includes information on the precautionary warnings which appear on the material's package label.

COPPER MSDS