MATERIAL SAFETY DATA SHEET

Prepared to U.S.OSH,CMA,ANSI and Canadian WHMIS Standards. This Material Safety Data Sheet is offered pursuant to OSHA's Hazard Communication Standard (29 CFR 1910.1200). Other government regulations must be reviewed for applicability to these products.

WARNING: PRODUCT COMPONENTS PRESENT HEALTH AND SAFETY HAZARDS. READ AND UNDERSTAND THIS MATERIAL SAFETY DATA SHEET (M.S.D.S). ALSO,FOLLOW YOUR EMPLOYER'S SAFETY PRACTICES. This product may contain Chromium or Nickel which are listed by OSHA, NTP, or IARC as being a carcinogen or potential carcinogen. Use of this product may expose you or others to fumes and gases at levels exceeding those established by the American Conference of Governmental Industries Hygienists (ACGIH) or the Occupational Safety and Health Administration (OSHA). The information contained herein relates only to the specific product. If the product is combined with other materials, all component properties must be considered.

SECTION I

1. IDENTIFICATION

TRADE NAME: PAL-189,PAL-518,PAL-521,PAL-610,PAL-618,PAL-656
CHEMICAL NAME/CLASS: ERCu,ERCuSn-A,ERCuSn-C,ERCuAl-A1,ERCuAl-A2,ERCuSi-A
CLASSIFICATION: AWS A5.7, AWS A5.8
SUPPLIER: Shanghai Xiaou Industry Co.,Ltd.
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2. COMPOSITION and INFORMATION OF THE PRODUCT

CHEMICAL NAME	CAS#	% w/w	EXPOSURE LIMITS IN AIR (mg/m^3)	
			OSHA PEL	ACGIH TLV
Aluminum	7429-90-5	11.0	5 (fume)	5 (fume)
Copper	7440-50-8	98	0.1 (fume)	0.2 (fume)
Zinc	7440-66-6	1.0	5 (fume)	5 (fume)
Iron	7439-86-6	4.0	10	5
Lead	7439-92-1	0.02	0.05	0.05 (fume & dust)
Manganese	7439-95-5	1.5	1 (fume)	0.2 (fume)
Phosphorous (yellow)	7723-14-0	0.35	0.1	0.1
Nickel	7440-02-0	3.0	0.1 (soluble)	0.1 (soluble)
Silicon	7440-21-3	4.0	5 (respirable)	10 (dust)
Tin	7440-31-5	9.0	2	2

NE = Not Established Single values shown are maximum, unless otherwise noted.
Occupational Safety and Health Administration 29 CFR 1910.1000 Permissible Exposure Limit (PEL). American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV).

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: This product consists of coated rods with no odor. There are no immediate health hazards associated with the wire or rod product. This product is not reactive. If involved in a fire, this product may generate irritating iron, nickel, and manganese fumes and a variety of metal compounds. Emergency responders must wear personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: During welding operations, the most significant routes of exposure are via inhalation of fumes.

INHALATION: Inhalation of large amounts of particulates generated by these products during metal processing operations may result in irritation. Inhalation of copper oxide and zinc oxide fumes 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. Repeated over-exposures, via inhalation, to the dusts or fumes generated by these products during welding operations may have adverse effects on the lungs with possible pulmonary edema and emphysema (life-threatening lung injuries). Chronic over-exposure to Copper dust may cause tiredness, stuffiness, diarrhea, and vomiting. Refer to Section 10 (Stability and Reactivity) for information on the specific composition of welding fumes and gases. This product contains trace amounts of lead. Exposure to Lead fumes is not anticipated to be significant during occupational use of this product.

CONTACT WITH SKIN or EYES: Contact of these products 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 these products can be physically damaging to the eye (i.e. foreign object). Fumes generated during welding operations can be irritating to the skin and eyes.. Symptoms of

skin over-exposure may include irritation and redness. Contact with the molten wire will burn contaminated skin or eyes.
SKIN ABSORPTION: Skin absorption is not a significant route of over-exposure for any component of this product.
INGESTION: Ingestion is not anticipated to be a route of occupational exposure for these products. If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.
INJECTION: Though not a likely route of occupational exposure for this product, injection (via punctures or lacerations in the skin) may cause local reddening, tissue swelling, and discomfort.
HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in Lay Terms. Symptoms associated with over-exposure to this product and the fumes generated during welding operations are as follows:
ACUTE: The chief acute health hazard associated with these products would be the potential for irritation of contaminated skin and eyes when exposed to fumes during welding operations. Inhalation of large amounts of particulates generated by these products during metal processing operations may result in irritation. Inhalation of copper oxide and zinc oxide fumes can cause metal fume fever. Inhalation of large amounts of particulates generated by these products during metal processing operations can result in pneumoconiosis (a disease of the lungs). Contact with the molten material will burn contaminated skin or eyes. Severe ingestion over-exposure to Copper (a component of these products) may be fatal.
CHRONIC: Chronic skin over-exposure to the fumes of these products during welding operations may produce dermatitis (red, inflamed skin). Chronic over-exposure to Copper dust may cause tiredness, stuffiness, diarrhea, vomiting, discoloration of the skin and eyes, and kidney and liver disorder. Additionally, rare cases of allergic contact dermatitis have been reported in people working with copper dust. Exposure to high levels of airborne Lead may produce symptoms of anemia, insomnia, weakness, constipation, nausea and abdominal pain. Prolonged exposure may result in kidney and nervous system involvement. Women of child-bearing age should avoid exposure to Lead due to post natal effects. Lead, a trace component of these products, is potentially carcinogenic to humans. Refer to Section 11 (Toxicological Information) for further information.
TARGET ORGANS: ACUTE: For fumes: Skin, eyes, respiratory system. CHRONIC: For fumes: Respiratory system, skin, pancreas, and liver..

SECTION II

4. FIRST-AID MEASURES

Victims of chemical exposure must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with victim.
SKIN EXPOSURE: If fumes generated by welding operations involving this product contaminate the skin, begin decontamination with running water. If molten material contaminates the skin, immediately begin decontamination with cold, running water. Minimum flushing is for 15 minutes. Victim must seek medical attention if any adverse reaction occurs.
EYE EXPOSURE: If fumes generated by welding operations involving this product 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 fumes generated by welding operations involving this product are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions.
INGESTION: If swallowed call physician immediately! Do not induce vomiting unless directed by medical personnel. Rinse mouth with water if person is conscious. Never give fluids or induce vomiting if person is unconscious, having convulsions, or not breathing.
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Skin, respiratory, pancreas, and liver disorders may be aggravated by prolonged over-exposures to the dusts or fumes generated by this product.
RECOMMENDATIONS TO PHYSICIANS: Very heavy intoxication with Lead (a component of this product) can sometimes be detected by formation of a dark line on the gum margins, the so-called “lead line.” Treat symptoms and eliminate over-exposure. Be observant for renal problems and encephalopathy in the event of chronic over-exposures. Zinc (a component of this product) is antagonistic to the toxic effects of lead. Refer to the OSHA Lead Standard (29 CFR1910.1025; paragraph J) for specific information on Medical Surveillance requirements (i.e. Biological Monitoring, Medical examinations and consultations, blood tests and re-examination protocol).

5. FIRE-FIGHTING MEASURES

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

FIRE EXTINGUISHING MATERIALS:

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

UNUSUAL FIRE AND EXPLOSION HAZARDS: When involved in a fire, this material may decompose and produce irritating fumes containing iron, manganese, and nickel compounds. The molten material can present a significant thermal hazard to firefighters.
Explosion Sensitivity to Mechanical Impact: Not sensitive.
Explosion Sensitivity to Static Discharge: Not sensitive.
SPECIAL FIRE-FIGHTING PROCEDURES: Not applicable

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: These products are solid wire, with no spill or leak hazards.

SECTION III

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting this product ON YOU or IN YOU. Wash thoroughly after handling this product. Do not eat or drink while handling this material. Use ventilation and other engineering controls to minimize potential exposure to this product.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Avoid breathing fumes of these products during welding operations. Open containers on a stable surface. Packages of these products must be properly labeled. When these products are used during welding operations, follow the requirements of the Federal Occupational Safety and Health Welding and Cutting Standard (29 CFR 1910 Subpart Q) and the safety standards of the American National Standards Institute for welding and cutting (ANSI Z49.1).
Store packages in a cool, dry location. Storage in an atmosphere that is wet, moist, or highly humid may lead to corrosion of these products. Store away from incompatible materials (see Section 10, Stability and Reactivity

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 these products are used.
RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below guidelines listed in Section 2 (Composition and Information on Ingredients). If respiratory protection is needed (i.e. a Weld Fume Respirator, or Air-Line Respirator for welding in confined spaces), U.S. Federal OSHA Standard (29 CFR 1910.134), applicable U.S. State regulations, or the Canadian CSA Standard Z94.4-93 and applicable standards of Canadian Provinces. Respiratory Protection is recommended to be worn during welding operations. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). NIOSH respiratory protection recommendations for Copper (a main component of these products) are provided as follows:

CONCENTRATION	**RESPIRATOTY EQUIPMENT**
Up to 5 mg/m^3:	Dust and mist respirator.
Up to 10 mg/m^3:	Dust and mist respirator except single-use and quarter-mask respirator (if not present as a fume);or Supplied Air Respirator (SAR).
Up to 25 mg/m^3:	Powered air-purifying respirator with dust and mist filter(s); or SAR operated in a continuous-flow mode.
Up to 50 mg/m^3:	Full-facepiece respirator with high-efficiency particulate filter(s); or full-facepiece Self-Contained Breathing Apparatus (SCBA); or full-facepiece SAR; or powered air-purifying respirator with tight- fitting facepiece and high-efficiency particulate filter.
Up to 100 mg/m^3:	Positive pressure, full-facepiece SAR.
Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions:	Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.

NOTE: Follow the specific respiratory selection guidelines of the OSHA Lead Standard in regulated areas (as defined by 29 CFR 1910.1025)
EYE PROTECTION: Safety glasses. When these products are used in conjunction with welding, wear safety glasses, goggles, or face-shield with filter lens of appropriate shade number (per ANSI Z49.1-1988, "Safety in Welding and Cutting").

HAND PROTECTION: Wear gloves for routine industrial use. When these products are used in conjunction with welding, wear gloves that protect from sparks and flame (per ANSI Z49.1-1988, "Safety in Welding and Cutting").

BODY PROTECTION: Wear body protection appropriate for task.

9. PHYSICAL and CHEMICAL PROPERTIES

The following information is for Copper, a main component of these products, unless otherwise indicated:

RELATIVE VAPOR DENSITY (air = 1): Not applicable. **EVAPORATION RATE (nBuAc = 1):** Not applicable.

SPECIFIC GRAVITY (water = 1): 7.6-8.95 (For product) **pH:** Not applicable.

SOLUBILITY IN WATER: Insoluble. **ODOR THRESHOLD:** Not applicable.

VAPOR PRESSURE, mm Hg @ 20°C: Not applicable. **BOILING POINT:** 2595°C (4703°F)

FREEZING/MELTING POINT: 865-1243°C (1590-2270°F) [For product]

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not applicable.

The following information is for the products:

APPEARANCE AND COLOR: These products consist of odorless, light yellow to dark brown solid metal rods.

HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance is a distinctive characteristic of these products.

10. STABILITY and REACTIVITY

STABILITY: Stable.

DECOMPOSITION PRODUCTS: Thermal decomposition products can include copper, zinc, aluminum and lead compounds and a variety of metal oxides.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Strong acids, strong oxidizers, some halogenated compounds and mercury.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Uncontrolled exposure to extreme temperatures, incompatible materials.

SECTION IV

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: Presented below are human toxicological data available for the components of these products present in concentration greater than 1%. Other data for animals are available for the components of these products, but are not presented in this Material Safety Data Sheet.

COPPER:
TDLo:(oral,human)=120μg/kg; gastrointestinal tract effects

IRON:
TDLo (oral, child) =77 mg/kg;BAH, gastrointestinal tract, blood effects

LEAD:
Cytogenic Analysis System (unreported route, human) = 50 :g/m^3
TDLo (oral, women) 450mg/kg; peripheral and central nervous system effects
TCLo (inhalation, human) =10:g/m^3; gastrointestinal and liver effects

MANGANESE:
TCLo (inhalation,man)=2300μg/m^3; BRN, central nervous system effects

ZINC:
Skin Irritancy (human) =300μg/ 3 days/ intermittent; mild
TCLo (inhalation,human)=124mg/m^3/ 50minutes; pulmonary system, skin effect

SUSPECTED CANCER AGENT: The components of these products are listed as follows:

COPPER: EPA-D (Not Classifiable as to Human Carcinogenicity)

IRON (as Iron Oxide): IARC-3 Possibly Carcinogenic to Humans);,ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen)

LEAD: ACGIH-A3 (Animal Carcinogen); EPA-B2 (Probable Human Carcinogen-Sufficient Evidence from Animal Studies, Inadequate Evidence or no Data from Epidemiologic Studies); IARC-2B (Possibly Carcinogenic to Humans); Cytogenetic Analysis-Human-Unreported 50 mg/m^3

PHOSPHORUS: EPA-D (Not Classifiable as to Human Carcinogenicity)

MANGANESE: EPA-D (Not Classifiable as to Human Carcinogenicity)

ZINC: EPA-D, Not Classifiable as to Human Carcinogenicity (inadequate human and animal evidence of carcinogenicity or no data available)

The other components of these products are not found on the following lists: FEDERAL OSHA Z LIST, NTP, IARC, and CAL/OSHA and therefore are not considered to be, nor suspected to be, cancer-causing agents by these agencies. **IRRITANCY OF PRODUCT:** These products' dusts or fumes may be irritating to contaminated skin and eyes. Fumes may be irritating to the 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 these products and their components on the human reproductive system.

Mutagenicity: These products are not reported to produce mutagenic effects in humans. Animal mutation data are available for Lead (a trace component of these products); these data were obtained during clinical

studies on specific animal tissues exposed to high doses of this compound.

Embryotoxicity: Lead, a component of these products, is a potential human embryotoxin.

Teratogenicity: These products are not reported to cause teratogenic effects in humans. Clinical studies on test animals exposed to relatively high doses of Copper, and Lead (components of these products) indicates teratogenic effects. Reproductive Toxicity: These products are not reported to cause reproductive effects in humans. Clinical studies on test animals exposed to relatively high doses of Lead and Copper (components of these products) 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.

BIOLOGICAL EXPOSURE INDICES: The following Biological Exposure Indices (BEIs) have been determined for the components of this product.

CHEMICAL DETERMINANT	SAMPLING TIME	BEI
LEAD • Lead in blood	• Not critical	• 30 mg/100 ml

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: The components of these products are expected to persist in the environment for an extended period of time. Additional environmental data are available as follows:

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).

LEAD: Solubility: Insoluble in water. Biological Half-Life for lead in bones of humans is 10 years. Bioconcentration: Lead was absorbed (by fresh water filed crab) through the gills, and distributed to the haenolymph to hepatopancrease, muscle, and exoskeleton. Lead bioaccumlated over the course of the study showed a high degree of organ specificity.

ZINC: Solubility: Insoluble in water. Biological Half-Life for normal humans 162-500 days. Bioconcentration: The Bioconcentration Factor in edible portions of *Crassostrea virgina,* adult oyster) is 16,700 (total zinc).

EFFECT OF MATERIAL ON PLANTS or ANIMALS: These products are not expected to cause adverse effects on plant or animal life. Specific data on test animals are available but are not presented in this Material Safety Data Sheet.

EFFECT OF CHEMICAL ON AQUATIC LIFE: These products may cause adverse effects on aquatic life, especially if large quantities are released into bodies of water. Additional data are available as follows:

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
LC_{50} (*Anguilla* American eel) 96 hours = 6.4
MATC (*Oncorhynctshawtsch* chinook salmon) = 0.0074
NOAEL (*Oncorhynctshawtsch* chinook salmon) = 0.0074
MATC (*Salmo gairdneri* brown trout) = 0.01901
NOAEL (*Salmo gairdneri* brown trout) = 0.0114
LOAEL (*Salmo gairdneri* brown trout) = 0.0317

IRON:
LC (*Gymnodinium spendens*, plankton) = 1-30 mg/L/ 48 hours
LC (*Isocrysis galbana*, plankton) > 35 mg/L/ 48 hours
TC (*Isocrysis galbana*, plankton) = 1-30 mg/L/ 48 hours; growth inhibition
TC (*Thalassiosira pseudonana*, plankton) = 8-20 mg/L/ 48 hours; growth inhibition

IRON (continued):
LC (*Glenodiunium halli*, plankton) = 10 - 100 mg/L/ 48 hours
TC (*Glenodiunium halli*, plankton) = 0.5-10 mg/L/ 48 hours; growth inhibition

LEAD:
LC_{50} (Japanese quail) =, males, females, 14 days old, oral (5-day ad libitum in diet) = 5,000 ppm. At 1,000, 2236, and 5000 ppm, onset of toxic symptoms began at 7 days and remised at 11-12 days
Concentration for fresh and salt water fish, 0.1
Lobster die after 20 days when kept in lead-lined tanks. LC_{50} (brook tout) = 0.13 ppm
LC_{50} (rainbow trout) = 0.43 ppm

ZINC: Odorless zinc poisoning causes inflamed gills in fish. Laboratory studies of Atlantic salmon, rainbow trout, carp, and goldfish have shown avoidance reactions by these fish to zinc in water

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. These products, 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: Wastes of this product should be analyzed for Toxicity Characteristic Leach Procedure chemicals, as follows: Lead: D008, Regulated Level: 0.4 mg/L

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS NOT HAZARDOUS (Per 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.

NORTH AMERICAN EMERGENCY RESPONSE GUIDEBOOK NUMBER, 2000: Not applicable.