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WOLVERINE JOINING TECHNOLOGIES, LLC.

MATERIAL SAFETY DATA SHEET

Product: ESP1, PLYMETAL 5031, SILVALOY 50N, 1735

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Common Name : SILVER-COPPER-ZINC-CADMIUM-NICKEL BRAZING ALLOY  
Chemical Name : SILVER-COPPER-ZINC-CADMIUM-NICKEL BRAZING ALLOY  
Formula : Ag-Cu-Zn-Cd-Ni  
Product CAS No.: CHEMICAL MIXTURE  
Product Use : Welding/Brazing/Soldering

Supplier : WOLVERINE JOINING TECHNOLOGIES, LLC.  
Address : 235 KILVERT STREET  
City, St, Zip : WARWICK, RI 02886  
Phone : 1-401-739-9550

FOR CHEMICAL EMERGENCY CALL CHEMTREC (24 HOURS):  
1-800-424-9300 (US, Canada, Puerto Rico, Virgin Islands)  
1-703-527-3887 (Outside Above Area)

SECTION 2: COMPOSITION/INFORMATION ON INGREDIENTS

INGREDIENT	CAS NO.	% Wt.
SILVER	7440-22-4	20-60
COPPER	7440-50-8	10-60
ZINC	7440-66-6	5-30
CADMIUM	7440-43-9	5-30
NICKEL	7440-02-0	1-5

INGREDIENT NOTES

NOTE: The percentage by weight values reported for the ingredients in this product represent approximate formulation values.

NOTE: See Section 8 for Exposure Limits and Section 11 for Toxicological Information.

SECTION 3: HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

Metallic wire, rod or strip

Odorless

Flash Point: Not Applicable

Danger. Contains CADMIUM. Avoid creating dust.  
Contains SUSPECT CANCER HAZARD - Risk of cancer depends on route, duration and level of exposure.  
Prolonged or repeated inhalation or ingestion may cause damage to the lungs, blood, kidneys, prostate and liver.  
May cause respiratory tract irritation. Overexposure to freshly formed fumes may cause a flu-like illness called "metal fume fever".  
May cause eye and skin irritation.  
May cause allergic skin and respiratory reaction.  
Harmful if swallowed. Causes gastrointestinal irritation, abdominal pain, nausea, vomiting and diarrhea.  
Not a fire or explosion hazard in solid form. Finely divided dust may ignite and burn rapidly when mixed with air in the proper proportions. Toxic metal fumes may be released in a fire situation.

ROUTES OF ENTRY

Eyes? YES                      Skin? YES                      Inhalation? YES                      Ingestion? YES

POTENTIAL HEALTH EFFECTS

EYE CONTACT may cause irritation.

SKIN CONTACT causes irritation and may cause sensitization or allergic reactions which may be accentuated by heat and humidity. The symptoms of this NICKEL dermatitis, referred to as "nickel itch," may include an itching or burning sensation followed by the eruption of sores.

INHALATION causes upper respiratory irritation. Individuals hypersensitive to NICKEL may develop asthma, bronchitis, shortness of breath or wheezing.

INGESTION is harmful. May cause abdominal pain, nausea, vomiting and diarrhea. COPPER poisoning can result in hemolytic anemia and kidney, liver and spleen damage.

NOTE: Inhalation may cause excessive CADMIUM absorption resulting in pulmonary emphysema, mild anemia and/or kidney dysfunction.

NOTE: Inhalation of fumes may cause a flu-like illness called metal fume fever. Typically metal fume fever begins four to twelve hours after sufficient exposure to freshly formed fumes. The first symptoms are a metallic taste, dryness and irritation of the throat. Cough and shortness of breath may occur along with headache, fatigue, nausea, vomiting, muscle and joint pain, fever and chills. The syndrome runs its course in 24-48 hours.

NOTE: The potential health effects described above only apply if dust or fume is formed.

#### CARCINOGENICITY

NTP? YES

IARC? YES

OSHA? YES

NICKEL has been classified by both the International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) as having sufficient evidence of carcinogenicity in experimental animals. In addition, IARC has determined that there is inadequate evidence of carcinogenicity in humans (Class 2B). The American Conference of Governmental Industrial Hygienists (ACGIH) has categorized nickel as A5 (not suspected as a human carcinogen).

In evaluating CADMIUM and CADMIUM COMPOUNDS, the International Agency for Research on Cancer (IARC) has determined that there is sufficient evidence of carcinogenicity to humans (Group 1). The Occupational Safety and Health Administration (OSHA) and the American Conference of Governmental Industrial Hygienists (ACGIH) considers all cadmium and cadmium compounds to be a suspect human cancer hazard (A2). The National Toxicology Program (NTP) lists only cadmium and certain cadmium compounds as substances which may reasonably be anticipated to be carcinogenic. This product contains one of those cadmium compounds specifically identified by NTP.

#### CHRONIC HEALTH HAZARDS

Repeated or long-term exposure to CADMIUM, even at relatively low concentrations, may result in kidney damage and an increased risk of lung and prostate cancer.

Overexposure may lead to COPPER poisoning, resulting in hemolytic anemia and liver, kidney and spleen damage.

Excessive ZINC intake has been associated with copper deficiency anemia.

Prolonged or excessive exposures may result in argyria, a permanent localized blue-grey discoloration of the eyes, skin or mucous membranes.

Prolonged exposure to SILVER can cause damage to the nasal septum.

Refer to Potential Health Effects and Carcinogenicity.

#### MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

May adversely affect existing medical conditions, such as eye, skin, respiratory, blood, liver and/or kidney ailments.

Individuals with Wilson's Disease are at increased risk of COPPER poisoning.

NOTE: See Section 8 for Exposure Limits, Section 11 for Toxicological Information and Section 12 for Ecological Information.

SECTION 4: FIRST AID MEASURES

EYE CONTACT: Flush eyes with plenty of water. If irritation develops, call a physician.

SKIN CONTACT: Immediately wash skin with soap and plenty of water. If irritation persists, call a physician.

INHALATION: If exposed to excessive levels of metal fumes, remove to fresh air and seek medical attention.

INGESTION: If person is conscious and able to swallow, give large amounts of water to dilute. If vomiting occurs, keep head below hips to help prevent aspiration. Get medical attention immediately.

SECTION 5: FIRE-FIGHTING MEASURES

Flash Point: Not Applicable  
Auto-Ignition: Not Applicable  
LEL: Not Applicable  
UEL: Not Applicable

NFPA HAZARD CLASSIFICATION

Health: 2                      Flammable: 0                      Reactivity: 0

HMIS HAZARD CLASSIFICATION

Health: 2\*                      Flammable: 0                      Reactivity: 0                      Special: B

\* Indicates the possibility of chronic health effects. See Chronic Health Hazards in Section 3 for more information.

EXTINGUISHING MEDIA

Use carbon dioxide, chemical foam or dry chemical. Use any means for extinguishing surrounding fire.

Do NOT use water on metal fires.

SPECIAL FIRE FIGHTING PROCEDURES

Wear NIOSH/MSHA approved positive-pressure self-contained breathing apparatus and protective clothing as specified in 29 CFR 1910.156.

UNUSUAL FIRE AND EXPLOSION HAZARDS

Not a fire or explosion hazard in solid form. Finely divided dust may ignite and burn rapidly when mixed with air in the proper proportions. Toxic metal fumes may be released in a fire situation.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Contain spillage and scoop up or vacuum. Notification of the National Response Center (800/424-8802) may be required. Refer to EPA, DOT and applicable state and local regulations for current response information.

It is recommended that each user establish a spill prevention, control and countermeasure plan (SPCC). Such plan should include procedures applicable to proper storage, control and clean-up of spills, including reuse or disposal as appropriate (see Section 13: Disposal Considerations).

**\*\*NOTE\*\*** In the event of an accidental release of this material, the above procedures should be followed. Additionally, proper exposure controls and personal protection equipment should be used (see Section 8: Exposure Control/Personal Protection), and disposal of the material should be in accordance with Section 13: Disposal Considerations.

SECTION 7: HANDLING AND STORAGE

Wash thoroughly after handling.

Store in a cool, dry location away from incompatible materials.

NOTE: Consult the most recent OSHA CADMIUM Standard (1910.1027) and its attachments, appendices, etc., for full requirements, some of which are not covered in this Material Safety Data Sheet.

Avoid breathing any dust, mist or fumes resulting from the use of this product.

Avoid contact with any dusts, mists or fumes resulting from the use of this product.

Use only with adequate ventilation.

Do not eat, drink, or smoke in work area.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS

INGREDIENT	PEL-OSHA	TLV-ACGIH
SILVER		
CAS NO.: 7440-22-4	0.01 mg/m3	0.1 mg/m3
COPPER		
CAS NO.: 7440-50-8	0.1 mg/m3 (Fume) 1 mg/m3 (Dust)	0.2 mg/m3 (Fume) 1 mg/m3 (Dust)
ZINC		
CAS NO.: 7440-66-6	None Established	None Established

CADMIUM

CAS NO.: 7440-43-9	0.005 mg/m3	0.01 mg/m3 (as
	0.0025 mg/m3	Cd, total dust)
	ACTION LEVEL	0.002 mg/m3 (as
		Cd, respirable
		fraction)

NICKEL

CAS NO.: 7440-02-0	1 mg/m3	1.5 mg/m3
		(Inhalable
		fraction)

NOTE: Both OSHA and the ACGIH list welding fumes as having an exposure limit of 5 mg/m3 (total particulate not otherwise classified). However, the ACGIH states that welding fumes must be tested frequently for individual components which are likely to be present to determine whether specific exposure limits are exceeded.

NOTE: The permissible exposure limits (PELs), threshold limit values (TLVs), potential health effects statements and SARA hazard categories may not be applicable as the hazardous ingredients listed are in the solid form. If dust, powder or fume is generated then these statements will be applicable. Unless otherwise noted, all values are reported as 8-hour Time-Weighted Averages (TWAs) and total dust (particulates only). All ACGIH TLVs refer to the 1998 Standards. All OSHA PELs refer to 29 CFR Part 1910 Air Contaminants: Final Rule, January 19, 1989.

RESPIRATORY PROTECTION

If dust or fume is generated, a NIOSH/MSHA approved respirator may be necessary. Follow all requirements for respiratory programs and selection set forth in the OSHA regulations (29 CFR 1910.139).

VENTILATION

General; local exhaust ventilation as necessary to control any air contaminants to within their PELs or TLVs during the use of this product.

PROTECTIVE EQUIPMENT

Refer to ANSI/ASC Z49.1-94 (Safety in Welding, Cutting and Allied Processes), published by the American Welding Society, for further information on the selection of personal protective equipment. Safety glasses (with side shields). Body protection as necessary to prevent skin contact.

PERSONNEL SAMPLING PROCEDURE

For CADMIUM DUST and MISTS: Air sampling: Refer to NIOSH Manual of Analytical Methods (NMAM), 4th Edition, Method 7048.  
For NICKEL and COPPER: Refer to NIOSH Manual of Analytical Methods (NMAM), 4th Edition, Method 7300.  
For SILVER: Refer to NIOSH Manual of Analytical Methods (NMAM), 4th Edition, Method 7300.  
For ZINC OXIDE: Refer to NIOSH Manual of Analytical Methods (NMAM), 4th Edition, Method 7502.  
For ZINC COMPOUNDS: Refer to NIOSH Manual of Analytical Methods (NMAM), 4th Edition, Method 7030.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Metallic wire, rod or strip  
Odor: Odorless  
Boiling Point: Not Determined  
Specific Gravity (H2O=1): 8.10 to 9.65  
Melting Point: 625 °C  
Vapor Pressure (mm Hg): Not Applicable  
Vapor Density (Air=1): Not Applicable  
Evaporation Rate: Not Applicable  
% Solubility In Water: Insoluble  
pH: Not Applicable

SECTION 10: STABILITY AND REACTIVITY

Stability: Generally considered stable.  
Avoid: None expected.

INCOMPATIBILITY (Materials to Avoid)

Strong acids and bases, strong oxidizers, acetylene, ammonia, hydrogen peroxide, magnesium metal, halogens, ammonium nitrate, hydrogen sulfide, elemental sulfur, selenium, tellurium, chlorinated rubber, fluorine, performic acid, phosphorus.

HAZARDOUS DECOMPOSITION OR BY-PRODUCTS

Toxic metal oxides are emitted when heated above the melting point. The amount of fume evolved increases as the temperature rises.

Polymerization: Polymerization is not expected to occur.  
Avoid: Not applicable.

SECTION 11: TOXICOLOGICAL INFORMATION

CHEMICAL NAME	% Wt.	LD50	LC50
SILVER			
CAS NO.: 7440-22-4	20-60	Not Available	Not Available
COPPER			
CAS NO.: 7440-50-8	10-60	3.5 mg/kg MOUSE, intraperitoneal	Not Available
ZINC			
CAS NO.: 7440-66-6	5-30	Not Available	Not Available
CADMIUM			
CAS NO.: 7440-43-9	5-30	225 mg/kg RAT, oral	Not Available
NICKEL			
CAS NO.: 7440-02-0	1-5	Not Available	Not Available

NOTE: See Sections 3, 8 and 12 for additional information.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICITY

No data available.

ENVIRONMENTAL FATE

No data available.

SECTION 13: DISPOSAL CONSIDERATIONS

US EPA Waste Number: D006  
D011

This product may be a hazardous waste under EPA waste regulations (see EPA WASTE above). Before disposal, this product or mixture containing this product should be tested for toxicity characteristics (TC) under the current EPA Hazardous Waste Regulations TCLP testing procedures, 40 CFR Part 261 et seq. Disposal/recycling/reclamation requirements will vary by location and type of disposal selected. Consult with state and local regulatory authorities.

**\*\*NOTE\*\*** Chemical additions, processing or otherwise altering this material may make the waste management information presented above incomplete, inaccurate or otherwise inappropriate.

As local regulations may vary; all waste must be disposed/recycled/reclaimed in accordance with federal, state, and local environmental control regulations.

SECTION 14: TRANSPORT INFORMATION

INTERNATIONAL

UN Number: Not Regulated

UNITED STATES

EPA Waste Number: D006  
D011

DOT Classification: Not Regulated

CANADA

PIN Number: Not Regulated  
TDG Class: Not Regulated

EC

DGL: Not Determined

SECTION 15: REGULATORY INFORMATION

US FEDERAL REGULATIONS

TSCA: IN TSCA

SARA 311 AND 312 HAZARD CATEGORIES

IMMEDIATE (Acute) Health Hazard: YES

DELAYED (Chronic) Health Hazard: YES

FIRE Hazard: NO

REACTIVITY Hazard: NO

Sudden Release of PRESSURE: NO

SARA SECTION 313 NOTIFICATION

This product contains a toxic chemical (or chemicals) subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act of 1986 and 40 CFR Part 372.

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OZONE DEPLETING SUBSTANCES (ODS)

This product neither contains nor is manufactured with an ozone depleting substance subject to the labelling requirements of the Clean Air Act Amendments 1990 and 40 CFR Part 82.

VOLATILE ORGANIC COMPOUNDS (VOC)

None

US STATE REGULATIONS

CALIFORNIA: The State of California has a regulation (Proposition 65) which identifies specific chemicals known to the State of California to cause cancer or birth defects. Proposition 65 requires a disclosure for products sold within the State of California containing an identified chemical. The following information is required by the State of California for this product:

\*WARNING: This product contains chemicals known to the State of California to cause cancer.

\*WARNING: This product contains chemicals known to the State of California to cause birth defects or other reproductive harm.

VOLATILE ORGANIC COMPOUND (CARB): Not Determined

CANADIAN REGULATIONS

"This product has been classified in accordance with the hazard criteria of the *Controlled Products Regulations* and the MSDS contains all the information required by the *Controlled Products Regulations*."

DSL/NDSL: DSL

WHMIS Classification: Class D Division 2 Subdivision A  
Class D Division 2 Subdivision B

EUROPEAN REGULATIONS

EINECS: Yes

OTHER REGULATIONS

MITI (Japan): Yes

AICS (Australia): Yes

SECTION 16: OTHER INFORMATION

REVISIONS

Revision Number: 7

This MSDS has been revised in the following section(s):

PREPARATION INFORMATION

Prepared By: Wolverine Joining Technologies, and Wolverine Tube Inc.  
Corporate Environmental, Health and Safety Group.

Phone Number/Address: See Section 1

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This Material 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. The information in this Material Safety Data Sheet should be provided to all who will use, handle, store, transport, or otherwise be exposed to this product. This information has been prepared for the guidance of plant engineering, operations, and management and for persons working with or handling these products. The information presented in the MSDS is premised upon proper handling and anticipated uses and is for the material without chemical additions/alterations. We believe this information to be reliable and up-to-date as of the date of publication, but make no warranty that it is. Additionally, if this Material Safety Data Sheet is more than three years old, please contact the supplier at the phone number listed in Section 1 to make certain that this sheet is the most current. Copyright Wolverine Joining Technologies, LLC. License granted to make unlimited copies for internal use only.