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WOLVERINE JOINING TECHNOLOGIES, LLC.

MATERIAL SAFETY DATA SHEET

Product: SILVALOY Z-85M, 2170

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Common Name : SILVER-MANGANESE BRAZING ALLOY
Chemical Name : SILVER-MANGANESE BRAZING ALLOY
Formula : Ag-Mn
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 | 85 |
| MANGANESE | 7439-96-5 | 15 |

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

May cause eye and skin irritation.

May cause respiratory tract irritation. Overexposure to freshly formed fumes may cause a flu-like illness called "metal fume fever".

Excessive exposure to MANGANESE may cause neurological disturbances including muscle pain, spasms, hallucinations and uncontrollable behavior.

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 may cause irritation.

INHALATION may cause irritation of the respiratory tract. Short-term overexposure 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.

INGESTION: No adverse effects expected.

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

CARCINOGENICITY

NTP? NO

IARC? NO

OSHA? NO

CHRONIC HEALTH HAZARDS

Refer to Potential Health Effects.

The absorption of SILVER compounds into the circulation and the subsequent deposition of reduced silver in various tissues of the body may result in the production of a generalized greyish pigmentation of the skin and mucous membrane (argyria). Generalized argyria develops after 2 to 25 years of exposure. There are no systemic effects or symptoms and no physical disability. Once deposited, there is no known means by which this silver can be eliminated; the pigmentation is permanent. Prolonged exposure to SILVER can cause damage to the nasal septum.

Prolonged or repeated exposure may cause MANGANESE poisoning. "Manganism" is difficult to recognize. It is a Parkinsonian-like syndrome characterized by headache, anorexia, hypersomnia, loss of strength, spasms or pain in the muscles, possibly followed by uncontrollable behavior, hallucinations and confusion. Progression of the disease results in varied neurological manifestations such as disturbances of speech, vision, hearing, gait and balance; and tremors, as well as decreased pulmonary function and kidney and liver damage. Once established, manganism is irreversible and progressive, but not fatal.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

May aggravate existing respiratory and/or skin ailments.

Persons with anemia, liver, pulmonary or neurological disorders may be at increased risk from exposures to MANGANESE.

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: Procedures normally not needed. If large quantities are ingested, seek medical advice.

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.

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

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

Use only with adequate ventilation.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

EXPOSURE LIMITS

| INGREDIENT | PEL-OSHA | TLV-ACGIH |
|--------------------|-----------------------------|-----------------------|
| SILVER | | |
| CAS NO.: 7440-22-4 | 0.01 mg/m ³ | 0.1 mg/m ³ |
| MANGANESE | | |
| CAS NO.: 7439-96-5 | 5 mg/m ³ Ceiling | 0.2 mg/m ³ |

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.

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.

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.

RESPIRATORY PROTECTION

A NIOSH/MSHA-approved respirator is recommended if dust is generated.

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).

Impervious gloves.

PERSONNEL SAMPLING PROCEDURE

For METALLIC COMPONENTS: Refer to NIOSH Manual of Analytical Methods (NMAM), 4th Edition, Method 7300.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Metallic wire, rod or strip
Odor: Odorless
Boiling Point: Not Determined
Specific Gravity (H₂O=1): 9.89
Melting Point: 944.9 °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, oxidizing agents, acetylene, ammonia, hydrogen peroxide, chlorine, fluorine, nitric acid, nitrogen dioxide, phosphorus, sulfur dioxide, aluminum.

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 | 85 | Not Available | Not Available |
| MANGANESE | | | |
| CAS NO.: 7439-96-5 | 15 | 9,000 mg/kg RAT, oral | 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: D011

This product contains SILVER or silver compounds and disposal may be regulated under EPA hazardous waste regulations, waste number D011. Before disposal, this product or mixtures 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: 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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|----------------------------------|------------|-------|
| SILVER | 7440-22-4 | 85 |
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| OZONE DEPLETING SUBSTANCES (ODS) | | |

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

VOLATILE ORGANIC COMPOUNDS (VOC)

None

US STATE REGULATIONS

VOLATILE ORGANIC COMPOUND (CARB): None

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: Uncontrolled Product

EUROPEAN REGULATIONS

EINECS: Yes

OTHER REGULATIONS

MITI (Japan): Yes

AICS (Australia): Yes

SECTION 16: OTHER INFORMATION

REVISIONS

Revision Number: 7

PREPARATION INFORMATION

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

Phone Number/Address: See Section 1

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.