SAFETY DATA SHEET

SECTION 1  IDENTIFICATION

PRODUCT NAME: Tungsten Heavy Alloy
PRODUCT NUMBER: N/A
CAS NUMBER: 7440-33-7 (Tungsten), 7440-02-0 (Nickel), 7439-89-6 (Iron)
SYNONYMS: High Density Tungsten Alloy, Tungsten-Nickel-Iron Heavy Alloy

MANUFACTURER: Tungsten Heavy Powder & Parts
9097 Kenamar Drive
San Diego, CA 92121

PHONE: 858-693-6100
FAX: 858-693-8471
REVISION DATE: 11/2015

IN CASE OF TRANSPORTATION EMERGENCY, CONTACT CHEM-TREC: 1-800-424-9300

SECTION 2  HAZARDS IDENTIFICATION

CLASSIFICATION OF SUBSTANCE OR MIXTURE

Pictogram:

Signal Word: Warning

Hazard Statements
H313 May be harmful in contact with skin
H320 Causes eye irritation

Precautionary Phrases
P264 Wash skin thoroughly after handling.
P271 Use only outdoors or in a well-ventilated area.
P303+P352 IF ON SKIN: Wash with plenty of soap and water.
P305+P351+P338 IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy
P332+P313 If skin irritation occurs: Get medical advice/attention.
P337+P313 If eye irritation persists: Get medical advice/attention.
P370+P378 In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction

PRIMARY ROUTES OF ENTRY: Skin or eye contact.

HAZARD NOTES: Although Tungsten Heavy Alloy is a solid, grinding or other shaping of the solid can cause dust, and it is this dust that could cause skin or eye irritation. As a solid compound, tungsten heavy alloy presents no significant health risks per sé.
SECTION 3   COMPOSITION / INFORMATION ON INGREDIENTS

<table>
<thead>
<tr>
<th>Material</th>
<th>Percent</th>
<th>OSHA</th>
<th>ACGIH TWA</th>
<th>ACGIH STEL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tungsten</td>
<td>70 - 99.5</td>
<td>5 insoluble</td>
<td>6 insoluble</td>
<td>10 insoluble</td>
</tr>
<tr>
<td></td>
<td></td>
<td>1 soluble</td>
<td>1 soluble</td>
<td>3 soluble</td>
</tr>
<tr>
<td>Nickel</td>
<td>0 - 21</td>
<td>1 soluble and insoluble</td>
<td>1 insoluble</td>
<td>N/A</td>
</tr>
<tr>
<td>Iron</td>
<td>0 - 9</td>
<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
</tbody>
</table>

All exposure limits are in mg/m³

CHEMICAL FAMILY: Refractory Metal Alloy
CHEMICAL FORMULA: W+Ni+Fe

SECTION 4   FIRST AID MEASURES

SKIN CONTACT: Remove contaminated clothing, brush material off skin, and wash affected area well with soap and water. Launder before use. Seek medical attention if symptoms persist.

EYE IRRITATION: Flush eyes with clean, lukewarm water for 15 minutes. Obtain medical attention if irritation develops. Seek medical attention if symptoms persist.

DUST INHALATION: Remove victim to fresh air, keep warm and quiet, give oxygen if breathing is difficult and seek medical attention if symptoms persist.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY LONG TERM EXPOSURE: Pre-existing respiratory disorders

SECTION 5   FIRE FIGHTING MEASURES

METHOD USED: Class D Fire Extinguishing (Dry Powder)
FLASH POINT: N/A
AUTOIGNITION TEMPERATURE: N/A
FLAMMABLE LIMITS: Upper: N/A, Lower: N/A
EXTINGUISHING MEDIA: Tungsten rod, wire and fabricated products (like bucking bars) are not fire hazards. Fine dust generated during grinding operations may ignite if allowed to accumulate and subjected to an ignition source. Cover burning material with an inert powder, such as dry sand or limestone, to exclude oxygen.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Dust may present a fire or explosion hazard under favorable conditions of particle size, dispersion and a strong ignition source. However, under normal handling conditions, this is not expected to be a problem.

SPECIAL FIRE FIGHTING PROCEDURES: For a fire confined to a small area, use a respirator approved for toxic dusts and fumes. For a large fire involving this material, firefighters must wear self-contained breathing apparatus.

SECTION 6   ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED: Ventilate area of spill. Take care not to raise dust. Use non-sparking tools. Clean up using methods, which avoid dust, generation such as vacuuming (with appropriate filter to prevent airborne dust levels which exceed the TLV), wet dust mop or wet clean up. If airborne dust is generated, use an appropriate NIOSH-approved respirator.

WASTE DISPOSAL METHOD: Dispose of in accordance with local, state and federal regulations.

SECTION 7   HANDLING & STORAGE

Handling Precautions and Storage Requirements: In general, tungsten heavy alloys are safe materials to handle and use in almost all commonly encountered environments. Special precautions typically only apply in situations where dust is created as a byproduct of handling.

Maintain good housekeeping procedures to avoid accumulation of dust. Use clean-up methods, which minimize dust generation such as vacuuming or wet clean up. If airborne dust is generated, use an appropriate NIOSH approved respirators.
SECTION 7  HANDLING & STORAGE (continued)

Wash thoroughly after handling and before eating or smoking and at the end of the work shift. Do not shake clothing or other items to remove dust. Use a vacuum. Avoid dust inhalation and direct skin contact. Do not ingest, especially small pieces. Handle and store in a controlled environment.

SECTION 8  EXPOSURE CONTROLS AND PERSONAL PROTECTION

EYE PROTECTION: Wear chemical safety glasses or goggles
SKIN PROTECTION: Wear nitrile or rubber gloves
RESPIRATOR: Use a NIOSH-approved respirator when airborne dust concentrations exceed the TLV. See (29CFR 1910.134).
VENTILATION: Use local exhaust ventilation, which is adequate to limit personal exposure to levels, which do not exceed the TLV. If such equipment is not available, use respirators as specified above.
ADDITIONAL PROTECTION: Provide eyewash station, and washing facilities accessible to areas of use and handling.

SECTION 9  PHYSICAL AND CHEMICAL DATA

APPEARANCE: Gray metal solid
MELTING POINT: 3410°C (6170° F)
BOILING POINT: 5660°C (10220° F)
FLAMMABILITY: Only flammable as dust

ODOR: None
SOLUBILITY: Insoluble
RELATIVE DENSITY: 17 – 18.5 g/cc
UPPER / LOWER FLAMMABILITY LIMITS: N/A

SECTION 10  STABILITY AND REACTIVITY

STABILITY: Stable
INCOMPATIBILITY (MATERIAL TO AVOID): Avoid contact with strong oxidizers: Bromide pentafluoride, bromine, chlorine trifluoride, potassium perchlorate, potassium dichromate, nitryl fluorine, fluorine, oxygen difluoride, iodine pentafluoride, hydrogen sulfide, sodium peroxide, lead (IV) oxide, air. Extremely fine powders may be pyrophoric under certain conditions.
HAZARDOUS POLYMERIZATION: Will not occur.
HAZARDOUS DECOMPOSITION: None
WASTE DISPOSAL METHOD: Reclaim; remove to waste disposal facility operating in compliance with federal, state, or local environmental control regulations.

SECTION 11  TOXICOLOGICAL INFORMATION

TUNGSTEN: To the best of our knowledge, the chemical physical & toxicological properties of tungsten metal have not been thoroughly recorded. Tungsten compounds: Industrially, this element does not constitute an important health hazard. Exposure is related mainly to the dust arising from the crushing & milling of the two chief ores of tungsten, namely scheelite & wolframite. Large overdoses cause central nervous system disturbances, diarrhea, respiratory failure and death in experimental animals.

NICKEL: As an element, nickel is an IARC 2B and NTP 2 carcinogen, i.e. it is possibly carcinogenic to humans, but there is limited evidence in humans in the absence of sufficient evidence in experimental animals.

IRON: Only iron dust is a health hazard. When inhaled in large amounts, iron dust may cause pneumoconiosis (arc welder’s lung). Iron dust is not a concern when using this alloy as a solid.

COMPROUNDS: Tungsten compounds are considered somewhat toxic. However, elemental tungsten does not constitute an important health hazard. Exposure is related chiefly to any dust created. The feeding of 2, 5 and 10%of diet as tungsten metal over a period of 70 days has shown no marked effect upon the growth of rats, as measured in terms of weight gain. Nickel and many of its compounds are poisons and carcinogens. All airborne nickel contaminating dusts are regarded as carcinogenic by inhalation. Ingestion of large doses of nickel compounds (1-3mg/kg) has been shown to cause intestinal disorders, convulsions and asphyxia. Hypersensitivity to nickel is common and can cause allergic dermatitis, pulmonary
SECTION 11   TOXICOLOGICAL INFORMATION (continued)

asthma and conjunctivitis. The most common effect resulting from exposure to nickel compounds is the development of nickel contact dermatitis (or "nickel itch"). As noted above, the inhalation of large amounts of iron dust may result in iron pneumoconiosis (arc welder's lung). Chronic exposure to excess levels of iron (> 50-100mg Fe/day) can result in pathological deposition of iron in the body tissues, the symptoms of which are fibrosis of the pancreas, diabetes mellitus and liver cirrhosis.

SECTION 12   ECOLOGICAL INFORMATION

Mobility/Degradability: Will convert to tungsten oxide during prolonged contact with water.
Excotoxicity: Tungsten is not ecotoxic. Generally not hazardous to water

SECTION 13   DISPOSAL CONSIDERATIONS

This material must be disposed of in accordance with any and all applicable local, state and federal regulations. Material intended for disposal may be sold as scrap for reclamation purposes.

SECTION 14   TRANSPORT INFORMATION

D.O.T. TRANSPORTATION DATA: (49 CFR 172.101)
Shipping Name: Tungsten Alloy
Hazard Class: None
Packing Group: None
Label: No class label assigned.

SECTION 15   REGULATORY INFORMATION

DOT: Not regulated
SARA (TITLE III): Under applicable definitions, this material may meet the criteria for the delayed (chronic) health hazard category.
SARA (SECTION 313): Tungsten is not subject to the reporting requirements of Section 313 of Title III of the Superfund Amendments and Reauthorization Act (SARA) of 1986 and 40 CFR Part 372. However, Nickel may be subject to the reporting requirements of this section of SARA if its de minimis concentration exceeds 0.1 percent. See 40 CFR 372 for reporting requirements.
CANADIAN DSL INVENTORY: Listed
RCRA HAZARDOUS WASTE NUMBER: Not listed
TSCA: This material is registered under the regulation of the Toxic Substance Control Act

SECTION 16   OTHER INFORMATION

REASON FOR ISSUE: To comply with the new Globally Harmonized System of Classification & Labelling of Chemicals (GHS)
PREPARED BY: G. Sery
APPROVED BY: J. Sery
APPROVED DATE: December 2, 2015
SUPERSEDES DATE: January 2, 2012

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