



MATERIAL SAFETY DATA SHEET
WAH CHANG
PO BOX 460 - ALBANY, OREGON - 97321

SECTION 1. Revised: 7/20/2006 Product Number: 901

PRODUCT: NIOBIUM BASE ALLOYS (SOLIDS)
SYNONYMS: Columbium Base Alloys
CHEMICAL FAMILY: Niobium Alloys
HMIS HAZARD RATING: HEALTH = 0 FIRE = 1 REACTIVITY = 0

24 HOUR EMERGENCY ASSISTANCE
 WAH CHANG
 An Allegheny Technologies Company
 541-926-4211
 CHEMTREC
 800-424-9300

HMIS RATING: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic

SECTION 2. COMPOSITION, INGREDIENTS INFORMATION

| CHEMICAL COMPONENTS | % | C.A.S. NO. | OSHA/ACGIH EXPOSURE LIMITS | |
|---------------------|-------|------------|--|-------|
| | | | mg/m ³ or ppm* | |
| | | | PEL | TLV |
| Niobium | 45-99 | 3/1/7440 | 10 Total | N.Ap. |
| Titanium | 0-55 | 7440-32-6 | 10 Total | N.Ap. |
| Zirconium | 0-5 | 7440-67-7 | 5 | 10 |
| Hafnium | 0-30 | 7440-58-6 | 0.5 | N.Ap. |
| Tungsten | 0-20 | 7440-33-7 | 5 (Insoluble) | N.Ap. |
| Tantalum | 0-30 | 7440-25-7 | 5 | N.Ap. |
| Vanadium | 0-10 | 7440-62-2 | 0.05 (as V ₂ O ₅) | N.Ap. |
| Molybdenum | 0-10 | 7419-98-7 | 10 Total | N.Ap. |

PNOR = Particles Not Otherwise Regulated

SECTION 3. HAZARDS IDENTIFICATION

ROUTES OF ENTRY

- INHALATION: No (if dust is generated, yes)
- INGESTION: No
- SKIN ABSORPTION: No
- SKIN/EYE CONTACT: No (if dust is generated, yes)

N. Ap. = Not Applicable
 N. Av. = Not Available

SECTION 4. FIRST AID MEASURES

- INHALATION: Avoid breathing dust and fumes by getting into fresh air.
- EYE CONTACT: Normal procedure for foreign object.
- SKIN CONTACT: Normal procedure for washing body
- INGESTION: N.Ap.

SECTION 5. FIRE FIGHTING MEASURES

- IGNITION POINT: The solid metal will not ignite. High surface area materials such as 5 micron powder may auto-ignite at room temperature.
 - FLAMMABLE LIMITS: N.Av.
 - EXTINGUISHING MEDIA: Dry table salt or Type D fire extinguisher.
- FIRE FIGHTING PROCEDURES:** Isolate any burning materla.. Allow fires to burn out while preventing the fire from spreading. Wear reflective heat resistant suits. Small fires are controllable by smothering with dry ttable salt or using Type D dry powder fire extinguishing materal.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Do not spray water on burning fines, chips, or powder as a violent explosion may result. The hazard increases with finer particles. Carbon dioxide is not effective in extinguishing burning niobium alloys.

SECTION 6. ACCIDENTAL RELEASE MEASURES

SPILL OR LEAK PROCEDURES: Use North American Emergency Response Guidebook No. 133 for clean up of flammable solids. Keep finely divided powder during clean up of flammable solids. Keep finely divided powder or saw dust away from any source of ignition and cleanup immediately during cleanup avoid generation of dust.

SECTION 7. HANDLING AND STORAGE

PRECAUTIONS TO TAKE DURING HANDLING AND STORAGE:

Machining of niobium alloys may result in fine turnings, chips, dust, or fumes. Any material with a dimension less than 0.001 inches is flammable. Keep this material away from any source of ignition.

SECTION 8. EXPOSURE CONTROL, PERSONAL PROTECTION

RESPIRATORY PROTECTION: If dust or fumes are generated above exposure levels, wear the appropriate NIOSH-approved respirator.

PROTECTIVE CLOTHING: Use of gloves is advisable to avoid metal cuts.

EYE PROTECTION: Use normal precautions

ADDITIONAL PROTECTIVE MEASURES: None Known

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

BOILING POINT @ 760 mm Hg: Above 3000°C
 VAPOR DENSITY (AIR = 1): N.Ap.
 SPECIFIC GRAVITY (H₂O = 1): 5.6-11.9
 Ph OF SOLUTIONS: N.Ap.
 FREEZING/MELTING POINT: Above 1800°C
 SOLUBILITY (WEIGHT % IN WATER): Insoluble
 BULK DENSITY: Solid
 % VOLATILE BY VOLUME: Nonvolatile
 VAPOR PRESSURE: 0 @ 20°C
 EVAPORATION RATE: N.Ap.
 HEAT OF SOLUTION: N.Ap.
 APPEARANCE AND ODOR: Silver-grey metal, odorless

SECTION 10. STABILITY AND REACTIVITY

STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will not occur

CONDITIONS TO AVOID: See section 9. Discussion of pyrophoric nature of machining fines.

INCOMPATIBILITY (Materials to Avoid): Hydrofluoric acid or hydrofluoric-nitric acid mixtures rapidly dissolve niobium base alloys. Niobium alloy will ignite in cold fluorine and above 200°C will react exothermically with chlorine, bromine, and halocarbons such as carbon tetrachloride, carbon tetrafluoride and freons[™].

HAZARDOUS DECOMPOSITION PRODUCTS: These alloys will not decompose. However, the above reactions with incompatible materials will generate reaction products such as flammable hydrogen, toxic fumes of nitrogen oxide, or corrosive metal halide vapors.

SECTION 11. TOXICOLOGICAL INFORMATION

TARGET ORGANS: None Known

TOXICITY DATA: Niobium alloys have no known toxicity in the solid metallic form. However, if the alloy is dissolved, vaporized, or otherwise treated to release the alloying elements in a chemically active form, consider the possible inhalation toxicity of vanadium pentoxide and other metal oxide dusts or fumes.

CORROSIVE: No

CARCINOGEN: No

SENSITIZER: No

COMMENTS: Grinding of these alloys produces significant volumes of extremely fine oxide dusts. The health hazards of mixed and combined oxides containing vanadium are not well known. Good ventilation practice and/or personnel respiratory protection is suggested when grinding these alloys.

ACUTE EFFECTS FROM EXPOSURE: None known for the solid metal.

CHRONIC EFFECTS FROM EXPOSURE: None known for the solid metal.

REFERENCES: Sax & Lewis, Dangerous Properties of Industrial Materials, 7th Ed.
 Patty's Industrial Hygiene and Toxicology, 3rd Ed., Vol. 2A
 Registry of Toxic Effects of Chemical Substances, June 1991
 Casarett and Doull's Toxicology, 2nd Ed.
 Genium's Handbook of Safety, Health, and Environmental Data, 1999
 OSHA - 29CFR 1910, Table Z-1-A, January 1989
 ACGIH Threshold Limit Values for Chemical Substances, 2002.

SECTION 12. ECOLOGICAL PROTECTION

ENVIRONMENTAL HAZARDS: None. Niobium alloys are considered non-toxic.

SECTION 13. DISPOSAL CONSIDERATIONS

WASTE DISPOSAL: Comply with Federal, State and Local requirements for waste disposal. Non-recyclable powder or fines are considered a hazardous flammable solid.

SECTION 14. TRANSPORTATION REQUIREMENTS

DEPARTMENT OF TRANSPORTATION CLASSIFICATION:

For Solid Metal - Non Hazardous

D.O.T PROPER SHIPPING NAME

N.Ap.

PACKING GROUP

D.O.T. I.D. NUMBER

N.Ap.

HAZARD CLASS

LABELS REQUIRED

NORTH AMERICAN EMERGENCY RESPONSE GUIDE
NUMBER

SECTION 15. REGULATORY INFORMATION

Section 313 Supplier Notification: This product contains the following chemicals subject to the reporting requirements of Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 (40 CFR 372):

In addition to the ingredients listed in Section 2, this product contains the following chemicals considered by the State of California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65) as causing cancer or reproductive toxicity and for which warnings are now required:

The Comprehensive Environmental Response, Compensation, and Liability Act of 1990, Sec102 (40 CFR 302) requires that any "release" into the "environment" of these hazardous substances contained in a product in excess of the "reportable quantity" in any 24-hour period must be immediately reported to the National Response Center (800-424-8802). Reporting is not required under certain circumstances such as a federally permitted release or the release of certain metal solid particles with a diameter larger than 100 micrometers:

The Superfund Amendments and Reauthorization Act of 1986 (40 CFR 355) specifies certain emergency planning and notification requirements if these extremely hazardous substances are present in concentrations of greater than 1% at a facility in amounts greater than the threshold planning quantity:

If this product is discarded as a waste, it would be identified with the following hazardous waste classification under the Resource Conservation and Recovery Act (40 CFR 261). The act specifies requirements for the management and disposal of hazardous wastes:

Components on Canadian "ingredient Disclosure List":

TSCA (Toxic Substances Control Act): Components of this product listed on the TSCA Inventory are:

SECTION 16. OTHER INFORMATION

None

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