

123899 Electrode

1. Product Name : Copper-Chromium Alloy Product (CC Alloy)
2. Hazards Identification : No hazardoussness or poisonousness to emerge unless made To cerve outrageously
3. Fire Fighting Measures : No specific procedures
4. Handling and Storing Precautions : 30°C or less and 60%RH or less for pre-process Storage ; any more than 30°C or 60%RH least tolerable.

5. Physical and Chemical Properties :

Product nature	Copper-chromium alloy
Outlook	Brown solid
Specific gravity	8.95
Contents %	Cr : 0.7~1.1 Cu : remainder
Melting point	1083°C

6. Stability and Reactivity : Extremely stable and nonflammable

7. Toxicological Information : as each simple element

Mouse LD 50 mg/kg	Man TLV (ppm)
Copper 15.8	Copper 1
Chromium Un-known	Chromium Un-known

8. Ecological Information (elution of Ions In water) :

Toxicity for gold fish (Wakin TLm ppm)
Copper 0.19
Chromium Un-known

9. Discarding Precautions : No specific procedure

10. References : (1) Aquatic Organism and Heavy Metals
Scientist Co., Ltd. (1979) . . . Japan
(2) Environmental Pollution and Poisonous / Hazardous Substance
(Inorganics)
(3) Trace Elements (Nutriment and Toxicity)

MATERIAL SAFETY DATA SHEET

TELEDYNE WAH CHANG ALBANY
P. O. BOX 460 ALBANY OREGON 97321

SECTION 1 Revised: 4/04/95 Number: 401 Page: 1 of

PRODUCT: HAFNIUM METAL

24 HOUR EMERGENCY
 ASSISTANCE

SYNONYMS: Crystal Bar Hafnium
 Iodide Bar Hafnium

TELEDYNE WAH CHANG
 ALBANY

503-926-4211

CHEMICAL FAMILY: Group 4 Metal

CHEMTREC

800-424-9300

HMIS HAZARD RATING: HEALTH - 0 FIRE - 0 REACTIVITY - 0

KEY: 0 - Minimal; 1 - Slight; 2 - Moderate; 3 - Serious; 4 - Severe; * - Chronic Hazard

This MSDS applies to solid unalloyed hafnium metal and crystal bar hafnium.

FIRE DANGER:

Fine chips, turnings, sawdust, or grinding dust produced from this metal are flammable.

CHEMICAL COMPONENTS	%	C.A.S. NO.	OSHA EXPOSURE LIMITS (mg/m ³)	
			TEA	STEL

Hafnium, Hf	97-99.8	7440-58-6	0.5	---
Zirconium, Zr	0.05-3	7440-67-7	5	10

BOILING POINT @ 760 MM HG: 4600°C
 VAPOR DENSITY (AIR = 1): N.Ap.
 SPECIFIC GRAVITY (H₂O = 1): 13.3
 PH OF SOLUTIONS: N.Ap.
 FREEZING/MELTING POINT: 2227 +20°C
 SOLUBILITY (WEIGHT % IN WATER): Insoluble
 BULK DENSITY: 830 lb/ft³ (solid)
 % VOLATILE BY VOLUME: Nonvolatile
 VAPOR PRESSURE: 0 @ 20°C
 EVAPORATION RATE: None
 HEAT OF SOLUTION: N.Ap.
 APPEARANCE AND ODOR: Similar to Stainless Steel

N.Ap.-Not Applicable
 N.Av.-Not Available

MATERIAL SAFETY DATA SHEET

Number: 401 Page: 2 of 4

STABILITY: Stable

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: See Section 9, Discussion of Flammable Nature of Machining Finest.

INCOMPATIBILITY (MATERIALS TO AVOID): Hafnium metal is rapidly dissolved by hydrofluoric acid or hydrofluoric-nitric acid mixtures. Above 200°C hafnium reacts exothermically with fluorine, chlorine, bromine, iodine and with halocarbons, including carbon tetrachloride, carbon tetrafluoride and Freons[™].

HAZARDOUS DECOMPOSITION PRODUCTS: Hafnium metal does not decompose. The above reactions with incompatible materials will generate hazardous reaction products such as flammable hydrogen, toxic fumes of nitrogen oxides or corrosive hafnium halide vapors.

IGNITION POINT: Solid hafnium will not ignite. 10 micron powder may autoignite at room temperature.

MINIMUM EXPLOSIBLE CONCENTRATION (g/m³): Not known

EXTINGUISHING MEDIA: Type D Fire Extinguisher. Dry table salt.

FIRE FIGHTING PROCEDURES: Isolate burning material. It is advisable to allow large fires to burn out, keeping the fire from spreading. Wear reflective heat resistant suit. Small fires can be controlled by smothering with dry salt or using Type D dry-powder fire extinguishing material.

UNUSUAL FIRE AND EXPLOSION HAZARDS: Do not spray water on burning fines, chips, powder or sponge as a violent explosion may result. This hazard increases with finer particles.

If a fire starts in a mass of wet metal fines, such as a barrel of damp machining chips, the initial fire may be followed by an explosion and a very high temperature flash radiation. Therefore, when in doubt, personnel should retire and not attempt to extinguish the fire. The explosive characteristic of such material is caused by the hydrogen and steam generated by the burning mass.

Carbon dioxide is not effective in extinguishing burning hafnium.

ROUTES OF ENTRY

INHALATION: No

INGESTION: No

SKIN ABSORPTION: No

SKIN/EYE CONTACT: No

TARGET ORGANS: Not known

TOXICITY DATA: Hafnium metal has no known toxicity. The metal is completely insoluble in water, saline solutions or body chemicals.

CORROSIVE: No

CARCINOGEN: No

SENSITIZER: No

MATERIAL SAFETY DATA SHEET

Number: 401 Page: 3 of 4

COMMENTS: No industrial disease has been evident with up to 20 years exposure to hafnium compounds.

ACUTE EFFECTS FROM EXPOSURE: None Known

CHRONIC EFFECTS FROM EXPOSURE: None Known

REFERENCES: NIOSH/OSHA - Occupational Health Guidelines for Chemical Hazards.

Casarett and Doull's Toxicology, 2nd Edition.

OSHA - 29 CFR 1910, Table Z-1-A, January 1989.

INHALATION: N.Ap.

EYE CONTACT: Normal procedure for inert foreign object.

SKIN CONTACT: Normal procedure for cuts from sharp metal.

INGESTION: N.Ap.

RESPIRATORY PROTECTION: Wear appropriate NIOSH-approved respirator while conducting operations such as surface grinding which will generate respirable dust.

PROTECTIVE CLOTHING: Use gloves to avoid cuts.

EYE PROTECTION: Wear goggles or face mask while conducting operations such as surface grinding which will generate flying particles.

ADDITIONAL PROTECTIVE MEASURES: Wear reflective heat resistant suit while burning fine scrap.

PRECAUTIONS TO BE TAKEN DURING HANDLING AND STORAGE: Machining of hafnium may result in fine turnings, chips or dust. Any material with a dimension less than 0.0625 inch (1/16 in.) or a cross section less than 0.0078 inch square (1/16 x 1/8), if present in any quantity, can be ignited and can sustain combustion. Keep away from any source of ignition.

Keep fine turnings completely dry, or very wet. If wet, the water content should be more than 25% by weight for maximum safety in handling. Severe explosions can result from ignition of hafnium powder or machining fines containing moisture in the concentration range of 5 to 10%.

ADDITIONAL PROTECTIVE MEASURES: Do not accumulate large quantities of fines or machining residues. Dispose of these materials in small lots daily.

MATERIAL SAFETY DATA SHEET

Number: 401 Page: 4 of 4

SPILL OR LEAK PROCEDURES: No special procedures.
WASTE DISPOSAL: Fine non-recyclable scrap should be burned in small quantities under controlled conditions. Resultant hafnium oxide can be deposited in a landfill.
ENVIRONMENTAL HAZARDS: None

DEPARTMENT OF TRANSPORTATION CLASSIFICATION: Not hazardous by D.O.T. Regulations.

D.O.T PROPER SHIPPING NAME

N.Ap.

D.O.T. I.D. NUMBER

N.Ap.

PACKING GROUP

N.Ap.

HAZARD CLASS

N.Ap.

LABELS REQUIRED

N.Ap.

EMERGENCY RESPONSE D.O.T. NUMBER

N.Ap.

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): None

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: None

The Comprehensive Environmental Response, Compensation, and Liability Act of 1990, Section 102 (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 inert solid particles with a diameter larger than 100 micrometers: None

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: None

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: Not hazardous

Components on Canadian "Ingredient Disclosure List": Hafnium, elemental

TELEDYNE WAH CHANG ALBANY
P.O. BOX 460
ALBANY, OREGON 97321

Date Revised: April 4, 1998

7/23/04 (2)

TO OTC DAIHEN INCORPORATED
ADDRESS 5311 WJ Harris Blvd
Charlotte, NC 28288



ALBANY, GREGORY 01774-0100
(41) 926-1231 FAX (41) 926-1232

ATTENTION OF: Purchasing Agent

IN REGARD TO YOUR
Purchase Order No.: 3044/TN07C024
Sales Order No.: 4971
Item No.: 1
Description: Hafnium Wire, Annealed
Dimensions: .063" Dia x Coil
Specifications: Per Purchase Order
Date Issued: January 8, 1998
Date Shipped: Ref. P.L.#
Quantity Shipped: 2 pcs.
Weight Shipped: 16.6 lbs.
Heat No.: 491875 H1
PACS No.: 38700

THE TEST REPORT FOLLOWS:

INGOT CHEMISTRY ANALYSIS: RESULTS IN PPM (UNLESS OTHERWISE NOTED)

Element	1	2	3
Al:	<25	<25	<25
C:	64	56	65
Co:	<5	<5	<5
Cr:	<20	<20	<20
Cu:	<25	<25	<25
Fe:	67	83	91
H:	<3	<3	<3
Mg:	<10	<10	<10
Mn:	<20	<20	<20
Mo:	43	44	56
N:	46	42	98
Nb:	<50	<50	<50
Ni:	<25	<25	<25
O:	270	300	260
Pb:	<5	<5	<5
Si:	<25	<25	<25
S:	<10	<10	<10
Ta:	<100	<100	<100
Ti:	<25	<25	<25
U:	<1	<1	1
V:	<10	<10	<10
W:	<10	<10	<10
Zr:	2.27%	2.78%	3.94%