H.C.Starck
High Performance Metal Solutions

Number PD-7033
Issue 2-05/05/2021

ULTRA 76 ALLOY (Ta 2.5%W)

Benefits

Significantly improved corrosion resistance in HCl and H_2SO_4 acids.
Minimized hydrogen embrittlement rates compared to standard NRC®76
- Up to 100 times lower in HCl acid
- Up to 10 times lower in H_2SO_4 acid

Eliminates the need for a separate Pt application step to protect against H embrittlement.
Maintains all the excellent mechanical properties of NRC®76.
Potential for increased operating temperatures in both HCl and H_2SO_4.

Applications

High strength alloy for corrosion applications in heat transfer equipment, vessels, piping, etc., and all applications where tantalum's physical properties are desired at a higher strength level than pure tantalum, and better corrosion resistance in HCl and H_2SO_4 acids.

Forms Available

Foil: 0.001" to 0.006" thick by widths up to 12" wide. Sheet: 0.006" to 0.1875" thick by widths up to 40" wide. Plate 0.1875" to 1" thick in common widths. Welded Tubing .015" to .035"wall x ½" to 2" diameter. Also, rod, plate, wire, bar and customer specified specialty sizes of all materials.

Chemical Characteristics[1)]
(Mass fraction in % [cg/g]; ppm [µg/g])

Element	ppm (max)	Element	ppm (max)
C	50	Ti	40
O	100	Ni	50
N	50	Mo	200
H	10	Si	25
Nb	0.1 % (1000)	W	2.0 - 3.5 wt %
Fe	50	PGM*	1000 - 2000
Ta	balance		

*Platinum Group Metals

Mechanical Properties (Design minimum)

Temp °F	Yield Strength 0.2% offset KSI	Tensile Strength (KSI)	Elongation % inch
70	35.5	50	20
210	30.5	48	15
390	27.4	42	10
480	25.5	40	10

Metallurgical Characteristics

Material is single-phase tantalum with tungsten and platinum group metals in solid solution.

Stress relieve	at 2000°F
Re-crystallize	at 2400°F

1) Information on testing methods on request.

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Physical Properties

Density		0.602	Lb/in^3
Melting Point		2996	°C
Coefficient of Expansion (20° - 500° C)		3.6 X 10^{-6}	$°F^{-1}$
Specific Heat (at 100° C)		0.0336	BTU/Lb°F
Thermal Conductivity (20° – 100°)		32	BTU/Hr-Ft °F
Electrical Resistivity (0° – 100°)		14.7	Microhm-cm
Thermal Neutron Absorption Cross Section		21.3	Barns/atom
Typical Ultimate Tensile Strength at 20° C		45 - 55	KPSI
Typical Yield Strength at 20° C		35 - 45	KPSI
Modulus of Elasticity		27 X 10^6	PSI
Hardness as Annealed (Typical)	Vickers	115 - 160	
	Rockwell B	50 - 80	

Main Products

Bayonet Heaters - Single and multi-tube types for use in steam heating in corrosive atmospheres.
Heat Exchangers, **Condensers** and **Coils**
Thermocouple Protection Sheaths Loose lined or machined from solid.
Pumps, Bodies or **Cases, Shafts and Impellers -** For corrosive chemical solutions.
Paddle Stirrers and Agitators - Solid or covered (loose-lined)
Distillation Columns, **Boilers** and **Condensers**
Tantalum Clad Dip Pipes, **Heaters** and **Chemical Plant Equipment**
Repairs Kits - For tanks, vats and other glass-lined containers
Crucibles - In standard and special shapes and sizes
Furnaces and Furnace Parts - For use at temperatures up to 2500°F in controlled atmospheres.

Hazards identification in Advertising (Directive 67/548/EEC Article 26, Directive 1999/45/EC Article 13 and REGULATION (EC) No 1272/2008 Article 48)
Metal powder, flammable, n.o.s.

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In hydrochloric acid applications using higher temperatures and concentrations, Ultra 76 improves corrosion resistance, but more importantly, hydrogen embrittlement is minimized, as hydrogen pickup is reduced by two magnitudes over standard NRC®76 material. Similar results are seen in sulphuric acid applications. Use of Ultra 76 will help extend equipment life, reduce downtime and allow operation in more demanding environments compared to alternative materials.