MATERION

Data Sheet

ULTRA 76 Plus Alloy

ULTRA 76 Plus tantalum alloy (Ta-2.5%W-0.15Ru) offers higher strength and superior corrosion resistance compared to standard NRC® 76 (Ta-2.5%W). ULTRA 76 Plus provides minimized hydrogen embrittlement rates – up to 100 times lower in hydrochloric acid, and up to 10 times lower in sulfuric acid. It therefore eliminates the need for a separate "platinum spot welding" application step to protect against hydrogen embrittlement. With comparable properties to those of conventional tantalum alloys, ULTRA 76 Plus can be easily adopted to the same processing and fabrication techniques.

Benefits:

- Improved corrosion resistance
- Minimized hydrogen embrittlement rates
- High strength
- Longer equipment life
- Ability to stand up to increased operating temperatures
- Less operating downtime

Applications:

- Bayonet heaters - single and multi-tube types
- Heat exchangers, condensers and coils
- Thermocouple protection sheaths
- Pumps, bodies or cases, shafts and impellers
- Paddle stirrers and agitators
- Distillation columns and boilers
- Tantalum clad dip pipes, heaters and chemical plant equipment
- Crucibles in standard and special shapes and sizes

Chemical Characteristics* (Mass Fraction in % [cg/g]; ppm [µg/g])

Element	ppm (max)	Element	ppm (max)
Carbon	50	Titanium	40
Oxygen	100	Nickel	50
Nitrogen	50	Molybdenum	200
Hydrogen	10	Silicon	25
Niobium	0.1% (1000)	Tungsten	2.0 – 3.5 wt %
Iron	50	Platinum Group Metals	1000 - 2000
Tantalum	Balance		

*Information on testing methods available upon request.

Mechanical Properties (Design Minimum)

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

Metallurgical Characteristics

ULTRA 76 Plus alloy is a single-phase tantalum with tungsten and PGM (platinum group metals) in solid solution. Further metallurgical characteristics include:

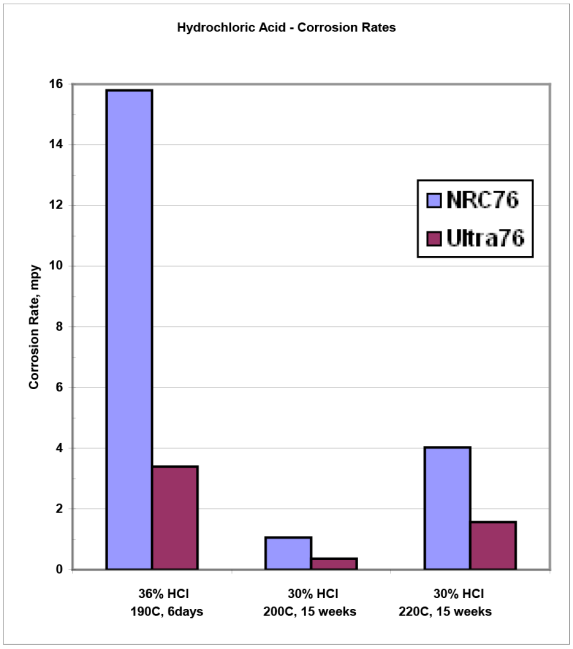
- Stress relieve at 2000˚F
- Re-crystallize at 2400˚F

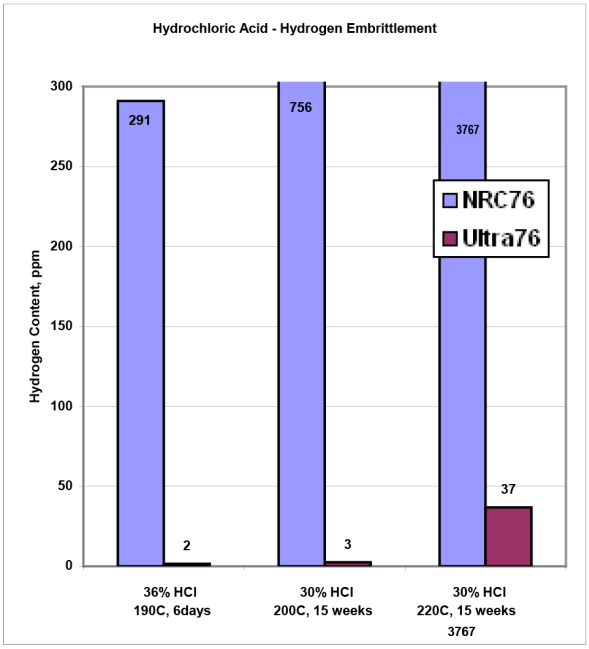
Physical Properties

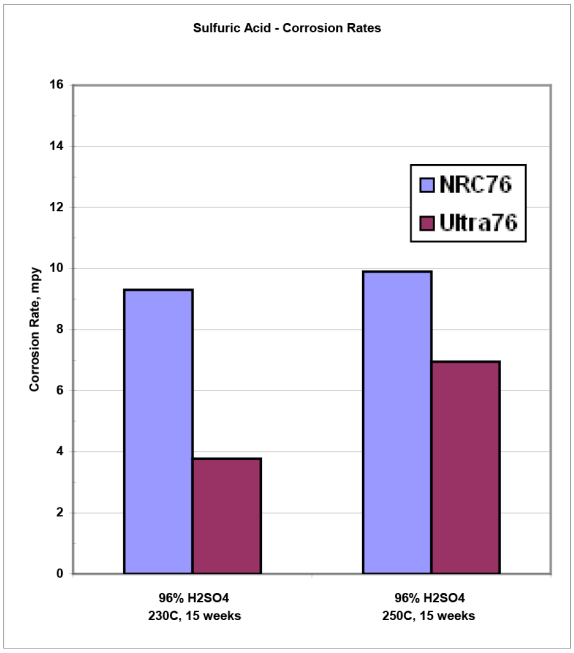
Property	Measurement
Density	0.602 lb./in^3
Melting Point	2996˚C
Coefficient of Expansion (20˚ - 500˚C)	3.6 x 10^{-6} ˚F^{-1}
Specific Heat (at 100˚C)	0.0336 BTU/lb.˚F
Thermal Conductivity (20˚ - 100˚C)	32 BTU/Hr-Ft ˚F
Electrical Resistivity (0˚ - 100˚C)	14.7 Microhm-cm
Thermal Neutron Absorption Cross 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

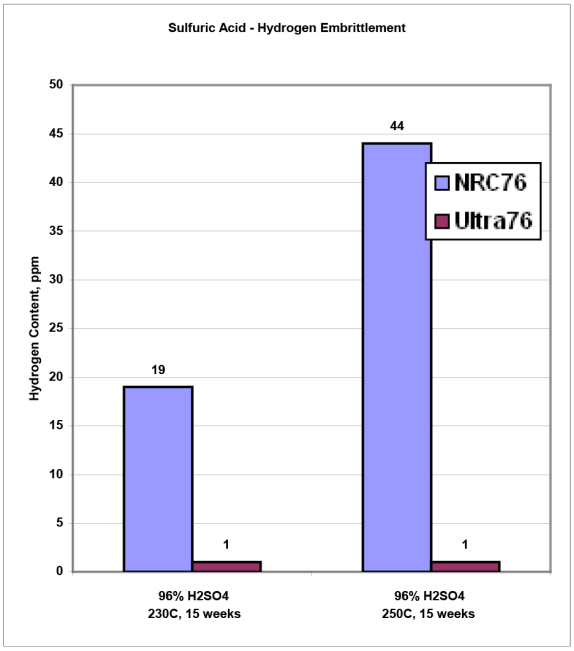
Comparison of the Corrosion Rates and Hydrogen Embrittlement of ULTRA 76 Plus and NRC 76 Alloys

In hydrochloric acid applications using higher temperatures and concentrations, ULTRA 76 Plus improves corrosion resistance. 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 Plus alloy will help extend equipment life, reduce downtime and allow operation in more demanding environments compared to alternative materials.









Forms Available

ULTRA 76 Plus is available in foil, sheet, plate, welded tubing, rod, wire, bar and customer-specified specialty sizes.

Sizes Available for Specified Forms

ULTRA 76 Plus Material	Dimensions (inches)	Dimensions (centimeters)
Foil	0.001” - 0.006” thick, up to 12” wide	0.0025 - 0.0152 cm thick, up to 30.5 cm width
Sheet	0.006” - 0.1875” thick, up to 40” wide	0.0152 - 0.48 cm thick, up to 102 cm width
Plate	0.1875” - 1” thick, common widths	0.48 - 2.54 cm thick, common widths
Welded Tubing	0.015” – 0.035” wall x ½” - 2” diameter	0.0381 - 0.0889 cm wall x 1.27 - 5 cm diameter

MATERION Global Headquarters
6070 Parkland Boulevard
Mayfield Heights, OH 44124 USA

Contact Us:
materion.com/ContactPAC
+1.800.375.4205

