

ATI Wah Chang Nb/Nb Alloy C-103

Category : Metal , Nonferrous Metal , Niobium Alloy

Material Notes:

This alloy satisfies most rocket engine applications for temperatures up to 2700°F because of superior mechanical properties at all temperatures. Offers weight savings over many rocket engine design materials. Information provided by ATI Wah Chang

Order this product through the following link:

http://www.lookpolymers.com/polymer_ATI-Wah-Chang-NbNb-Alloy-C-103.php

Physical Properties	Metric	English	Comments
Density	8.86 g/cc	0.320 lb/in ³	

Mechanical Properties	Metric	English	Comments
Tensile Strength, Ultimate	65.5 MPa	9500 psi	Vacuum
	@Temperature 1480 °C	@Temperature 2700 °F	
	89.6 MPa	13000 psi	Vacuum
	@Temperature 1370 °C	@Temperature 2500 °F	
	186 MPa	27000 psi	Vacuum
	@Temperature 1090 °C	@Temperature 2000 °F	
	310 MPa	45000 psi	Vacuum
	@Temperature 871 °C	@Temperature 1600 °F	
Tensile Strength, Yield	310 MPa	45000 psi	Vacuum
	@Temperature 538 °C	@Temperature 1000 °F	
	317 MPa	46000 psi	Vacuum
	@Temperature 649 °C	@Temperature 1200 °F	
	321 MPa	46500 psi	Vacuum
	@Temperature 760 °C	@Temperature 1400 °F	
	421 MPa	61000 psi	Vacuum
	@Temperature 23.0 °C	@Temperature 73.4 °F	
	59.3 MPa	8600 psi	Vacuum
	@Temperature 1480 °C	@Temperature 2700 °F	
	72.4 MPa	10500 psi	Vacuum
	@Temperature 1370 °C	@Temperature 2500 °F	
	138 MPa	20000 psi	

Mechanical Properties	Metric @ Temperature 1090 °C	English @ Temperature 2000 °F	Vacuum Comments
	162 MPa	23500 psi	Vacuum
	@Temperature 871 °C	@Temperature 1600 °F	
	172 MPa	25000 psi	Vacuum
	@Temperature 760 °C	@Temperature 1400 °F	
	186 MPa	27000 psi	Vacuum
	@Temperature 649 °C	@Temperature 1200 °F	
	200 MPa	29000 psi	Vacuum
	@Temperature 538 °C	@Temperature 1000 °F	
	296 MPa	43000 psi	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
Elongation at Break	15 - 17 %	15 - 17 %	Vacuum
	@Temperature 649 °C	@Temperature 1200 °F	
	16 - 18 %	16 - 18 %	Vacuum
	@Temperature 760 °C	@Temperature 1400 °F	
	18 - 19 %	18 - 19 %	Vacuum
	@Temperature 871 °C	@Temperature 1600 °F	
	19 - 21 %	19 - 21 %	Vacuum
	@Temperature 538 °C	@Temperature 1000 °F	
	25 - 30 %	25 - 30 %	
	@Temperature 23.0 °C	@Temperature 73.4 °F	
	>= 45 %	>= 45 %	Vacuum
	@Temperature 1090 °C	@Temperature 2000 °F	
	>= 70 %	>= 70 %	Vacuum
	@Temperature 1370 °C	@Temperature 2500 °F	
	>= 70 %	>= 70 %	Vacuum
	@Temperature 1480 °C	@Temperature 2700 °F	
Modulus of Elasticity	90.0 GPa	13100 ksi	
	64.0 GPa	9280 ksi	
	@Temperature 1200 °C	@Temperature 2190 °F	

Mechanical Properties	^{107 J} Metric	^{79.0 ft-lb} English	Comments
	@Temperature -73.3 °C	@Temperature -100 °F	
	201 J	148 ft-lb	
	@Temperature 23.0 °C	@Temperature 73.4 °F	

Thermal Properties	Metric	English	Comments
CTE, linear	6.84 µm/m-°C	3.80 µin/in-°F	
	@Temperature 93.3 °C	@Temperature 200 °F	
	7.02 µm/m-°C	3.90 µin/in-°F	
	@Temperature 316 °C	@Temperature 600 °F	
	7.20 µm/m-°C	4.00 µin/in-°F	
	@Temperature 538 °C	@Temperature 1000 °F	
	7.38 µm/m-°C	4.10 µin/in-°F	
	@Temperature 760 °C	@Temperature 1400 °F	
	7.74 µm/m-°C	4.30 µin/in-°F	
	@Temperature 982 °C	@Temperature 1800 °F	
	8.10 µm/m-°C	4.50 µin/in-°F	
	@Temperature 1200 °C	@Temperature 2200 °F	
Thermal Conductivity	38.0 W/m-K	264 BTU-in/hr-ft²-°F	
	@Temperature 871 °C	@Temperature 1600 °F	
	40.6 W/m-K	282 BTU-in/hr-ft²-°F	
	@Temperature 1113 °C	@Temperature 2035 °F	
	44.61 W/m-K	309.6 BTU-in/hr-ft²-°F	
	@Temperature 1300 °C	@Temperature 2380 °F	
Melting Point	2300 - 2400 °C	4170 - 4350 °F	
Solidus	2300 °C	4170 °F	
Liquidus	2400 °C	4350 °F	
Maximum Service Temperature, Air	1480 °C	2700 °F	most rocket engine applications

Optical Properties	Metric	English	Comments
Emissivity (0-1)	0.28	0.28	Total Hemispherical
	@Temperature 800 °C	@Temperature 1470 °F	

Optical Properties	Metric	English	Comments
	@Temperature 1200 °C	@Temperature 2190 °F	Total Hemispherical
	0.87	0.87	Cycle 3
	@Temperature 37.8 °C	@Temperature 100 °F	
	0.89	0.89	Cycle 3
	@Temperature 1320 °C	@Temperature 2400 °F	
	0.89	0.89	Cycle 2
	@Temperature 37.8 °C	@Temperature 100 °F	
	0.89	0.89	Cycle 1
	@Temperature 37.8 °C	@Temperature 100 °F	
	0.92	0.92	Cycle 1
	@Temperature 1320 °C	@Temperature 2400 °F	
	0.92	0.92	Cycle 2
	@Temperature 1320 °C	@Temperature 2400 °F	

Component Elements Properties	Metric	English	Comments
Hafnium, Hf	10 %	10 %	
Niobium, Nb (Columbium, Cb)	87 - 87.6 %	87 - 87.6 %	as balance
Tantalum, Ta	0.50 %	0.50 %	
Titanium, Ti	0.70 - 1.3 %	0.70 - 1.3 %	
Tungsten, W	0.50 %	0.50 %	
Zirconium, Zr	0.70 %	0.70 %	

Descriptive Properties	Value	Comments
Enthalpy, BTU/lb	103	1610°F
	145	2017°F
	184	2390°F

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