

Copper, Cu; Annealed

Categories: [Metal](#); [Nonferrous Metal](#); [Copper Alloy](#); [Pure Element](#)


Material Notes: Annealed applies only to tensile and/or hardness values; other property values are typical of the element. This entry is for pure Cu, MatWeb also has entries for many alloys.

In general, copper alloys exhibit good to excellent corrosion resistance and high thermal conductivity and very high electrical conductivity. Pure copper's electrical conductivity is so high that many metals are measured against it in the form of the IACS (International Annealed Copper Standard). Applications include architectural uses, coinage, condenser/heat exchangers, plumbing, radiator cores, musical instruments, locks, fasteners, hinges, ammunition components, and electrical connectors. Small amounts of alloying elements are often added to copper to improve certain characteristics. Alloying can increase or reduce the strength, hardness, electrical and thermal conductivity, corrosion resistance, or change the color. Common primary alloying elements include tin (resulting in bronze) or zinc (resulting in brass).



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Physical Properties		Metric	English	Comments
Density 		7.764 g/cc	0.2805 lb/in ³	
		@Temperature 1300 °C	@Temperature 2370 °F	
		7.846 g/cc	0.2835 lb/in ³	
		@Temperature 1200 °C	@Temperature 2190 °F	
		7.924 g/cc	0.2863 lb/in ³	
		@Temperature 1100 °C	@Temperature 2010 °F	
		7.94 g/cc	0.287 lb/in ³	
		@Temperature 1083.6 °C	@Temperature 1982.5 °F	
		8.93 g/cc	0.323 lb/in ³	
		@Temperature 20.0 °C	@Temperature 68.0 °F	
Chemical Properties		Metric	English	Comments
Atomic Mass		65.546	65.546	1995
Atomic Number		29	29	
Thermal Neutron Cross Section		3.8 barns/atom	3.8 barns/atom	
X-ray Absorption Edge		1.38 Å	1.38 Å	K
		11.269 Å	11.269 Å	L _I
		12.994 Å	12.994 Å	L _{II}
		13.2578 Å	13.2578 Å	L _{III}
Electrode Potential		-0.520 V	-0.520 V	monovalent
		-0.340 V	-0.340 V	divalent
Electronegativity		1.9	1.9	Pauling
Ionic Radius		0.720 Å	0.720 Å	Crystal Ionic Radius for Valence +2
		0.960 Å	0.960 Å	Crystal Ionic Radius for Valence +1
Electrochemical Equivalent		1.185 g/A/h	1.185 g/A/h	divalent
		2.38 g/A/h	2.38 g/A/h	monovalent
Mechanical Properties		Metric	English	Comments
Hardness, Vickers		50	50	
Tensile Strength, Ultimate		210 MPa	30500 psi	
Tensile Strength, Yield		33.3 MPa	4830 psi	
Elongation at Break		60 %	60 %	
Modulus of Elasticity		110 GPa	16000 ksi	
Bulk Modulus		140 GPa	20300 ksi	
Poissons Ratio		0.343	0.343	
Shear Modulus		46.0 GPa	6670 ksi	
Electrical Properties		Metric	English	Comments
Electrical Resistivity		0.00000170 ohm-cm	0.00000170 ohm-cm	

Magnetic Susceptibility	-8.00e-8	-8.00e-8	cgs/g
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Thermal Properties	Metric	English	Comments
Heat of Fusion	204.8 J/g	88.10 BTU/lb	
Heat of Vaporization	5234 J/g	2252 BTU/lb	
CTE, linear 	16.4 µm/m-°C	9.11 µin/in-°F	
	@Temperature 20.0 - 100 °C	@Temperature 68.0 - 212 °F	
	18.5 µm/m-°C	10.3 µin/in-°F	
	@Temperature 250 °C	@Temperature 482 °F	
	20.2 µm/m-°C	11.2 µin/in-°F	
	@Temperature 500 °C	@Temperature 932 °F	
	24.8 µm/m-°C	13.8 µin/in-°F	
	@Temperature 925 °C	@Temperature 1700 °F	
Specific Heat Capacity	0.385 J/g-°C	0.0920 BTU/lb-°F	
Thermal Conductivity 	385 W/m-K	2670 BTU-in/hr-ft²-°F	
	357 W/m-K	2480 BTU-in/hr-ft²-°F	
	@Temperature 727 °C	@Temperature 1340 °F	
	398 W/m-K	2760 BTU-in/hr-ft²-°F	
	@Temperature 27.0 °C	@Temperature 80.6 °F	
	401 W/m-K	2780 BTU-in/hr-ft²-°F	
	@Temperature 0.000 °C	@Temperature 32.0 °F	
	483 W/m-K	3350 BTU-in/hr-ft²-°F	
	@Temperature -173 °C	@Temperature -279 °F	
	10500 W/m-K	72900 BTU-in/hr-ft²-°F	
	@Temperature -253 °C	@Temperature -423 °F	
	19600 W/m-K	136000 BTU-in/hr-ft²-°F	
	@Temperature -263 °C	@Temperature -441 °F	
Melting Point	1083.2 - 1083.6 °C	1981.8 - 1982.5 °F	
Boiling Point	2562 °C	4644 °F	

Optical Properties	Metric	English	Comments
Emissivity (0-1)	0.15	0.15	polished
	@Wavelength >=655 nm, Temperature 807 °C	@Wavelength >=655 nm, Temperature 1480 °F	
Reflection Coefficient, Visible (0-1)	0.63	0.63	

Component Elements Properties	Metric	English	Comments
Copper, Cu	100 %	100 %	

Descriptive Properties	
CAS Number	7440-50-8

[References](#) for this datasheet.

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's [terms of use](#) regarding this information. [Click here](#) to view all the property values for this datasheet as they were originally entered into MatWeb.