Aluminum, Al

Categories: Metal; Nonferrous Metal; Aluminum Alloy; Pure Element

Material Notes: Aluminum is a silver-colored, low density (2.7 g/cc) metal that finds use in a huge variety of commercial applications. Unalloyed aluminum is ductile, exhibits moderate strength, and is very resistant to corrosion under most circumstances. Aluminum can be strengthened by the addition of appropriate alloying elements (Cu, Mg, Mn, Si, etc.) and subsequent heat/work treatments. Aluminum is commonly used in both wrought and cast forms.

The low density of aluminum results in its extensive use in the aerospace industry, and in other transportation fields. Its resistance to corrosion leads to its use in food and chemical handling (cookware, pressure vessels, etc.) and to architectural uses.

Over 1700 Aluminum alloy entries are listed in MatWeb, each with specific property data. Aluminum 1199 is the highest purity (99.99% Al min.) commercially available in structural form.

Physical Properties	Metric	English	Comments
Density	2.6989 g/cc	0.097504 lb/in³	

Chemical Properties	Metric	English	Comments
Atomic Mass	26.98154	26.98154	26.981538 - 1995
Atomic Number	13	13	
Thermal Neutron Cross Section	0.215 barns/atom	0.215 barns/atom	
X-ray Absorption Edge	7.9511 Å	7.9511 Å	K
	142.48 Å	142.48 Å	L_I
	172.16 Å	172.16 Å	L_{II}
	172.16 Å	172.16 Å	L_{III}
Electrode Potential	-1.69 V	-1.69 V	
Electronegativity	1.61	1.61	Pauling
Ionic Radius	0.510 Å	0.510 Å	Crystal Ionic Radius for Valence +3
Electrochemical Equivalent	0.3354 g/A/h	0.3354 g/A/h	

Mechanical Properties	Metric	English	Comments
Hardness, Vickers	15	15	Annealed
Modulus of Elasticity	68.0 GPa	9860 ksi	
Poissons Ratio	0.36	0.36	calculated
Shear Modulus	25.0 GPa	3630 ksi	

Electrical Properties	Metric	English	Comments
Electrical Resistivity	0.00000270 ohm-cm	0.00000270 ohm-cm	
Magnetic Susceptibility	6.0e-7	6.0e-7	cgs/g
Critical Magnetic Field Strength, Oersted	101.9 - 107.9	101.9 - 107.9	
Critical Superconducting Temperature	1.73 - 1.77 K	1.73 - 1.77 K	

Thermal Properties	Metric	English	Comments
Heat of Fusion	386.9 J/g	166.4 BTU/lb	
Heat of Vaporization	9462 J/g	4071 BTU/lb	
CTE, linear	24.0 µm/m-°C @Temperature 20.0 - 100 °C	13.3 µin/in-°F @Temperature 68.0 - 212 °F	
	25.5 µm/m-°C @Temperature 20.0 - 300 °C	14.2 µin/in-°F @Temperature 68.0 - 572 °F	
	27.4 µm/m-°C @Temperature 20.0 - 500 °C	15.2 µin/in-°F @Temperature 68.0 - 932 °F	
Specific Heat Capacity	0.900 J/g-°C	0.215 BTU/lb-°F	
Thermal Conductivity	210 W/m-K	1460 BTU-in/hr-ft²-°F	
Melting Point	660.37 °C	1220.7 °F	

Boiling Point	2519 °C	4566 °F	

Optical Properties	Metric	English	Comments
Emissivity (0-1)	0.20 - 0.30	0.20 - 0.30	strongly oxidized
☒	0.050	0.050	polished
	@Temperature 50.0 - 500 °C	@Temperature 122 - 932 °F	
Reflection Coefficient, Visible (0-1)	0.90	0.90	tungsten light

Component Elements Properties	Metric	English	Comments
Aluminum, Al	100 %	100 %	

Descriptive Properties

CAS Number	7429-90-5

References for this datasheet.