

4032 (4032-T6, AlSi12.5MgCuNi) Aluminum

4032 aluminum is a 4000-series aluminum alloy. The main alloying addition is silicon. It is typically furnished in the T6 temper. To achieve this temper, the metal is solution heat-treated and artificially aged until it meets standard mechanical property requirements. 4032 is the Aluminum Association (AA) designation for this material. In European standards, it will typically be given as EN AW-4032. Additionally, the EN chemical designation is AlSi12,5MgCuNi. The British Standard (BS) designation is DTD324B. The AFNOR designation is A-S12UGN. And the UNS number is A94032.

It originally received its standard designation in 1954.

It has the highest tensile strength relative to other 4000-series alloys in the database.

The graph bars on the material properties cards below compare 4032 aluminum to: 4000-series alloys (top), all aluminum alloys (middle), and the entire database (bottom).

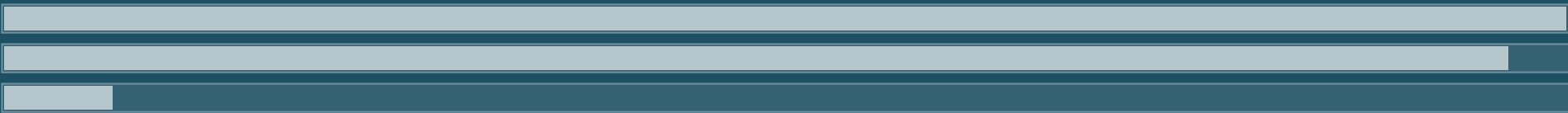
Mechanical Properties

Brinell Hardness



120

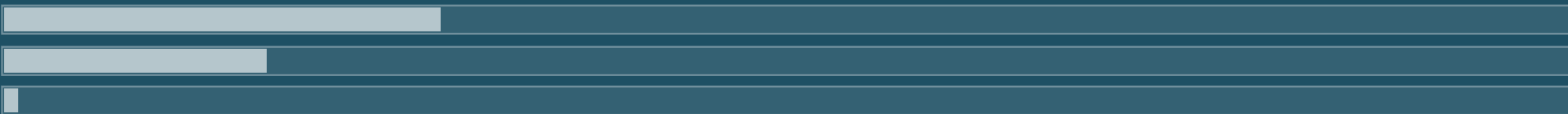
Elastic (Young's, Tensile) Modulus



73 GPa

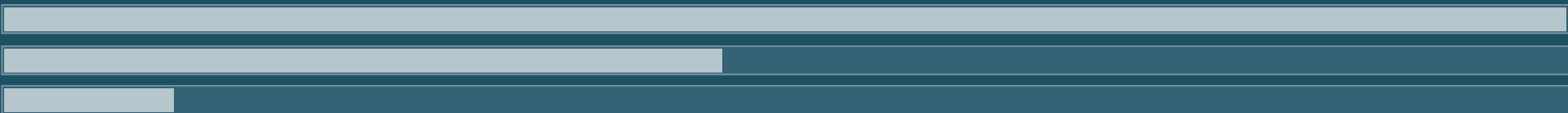
11 x 10⁶ psi

Elongation at Break



6.7 %

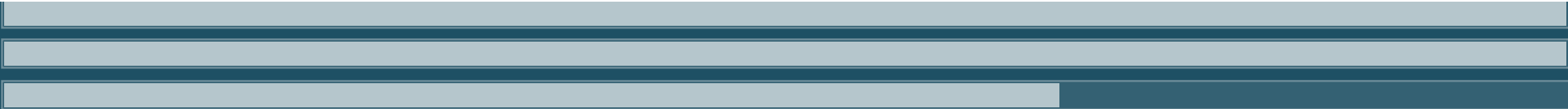
Fatigue Strength



110 MPa

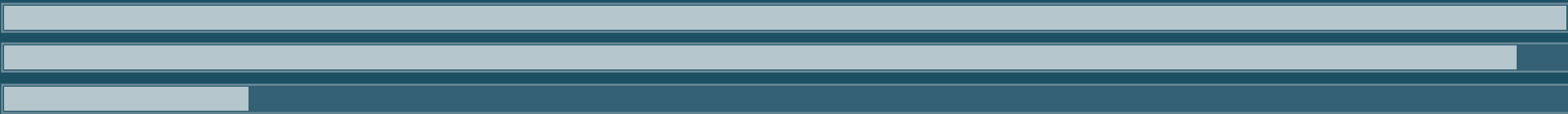
16 x 10³ psi

Poisson's Ratio



0.33

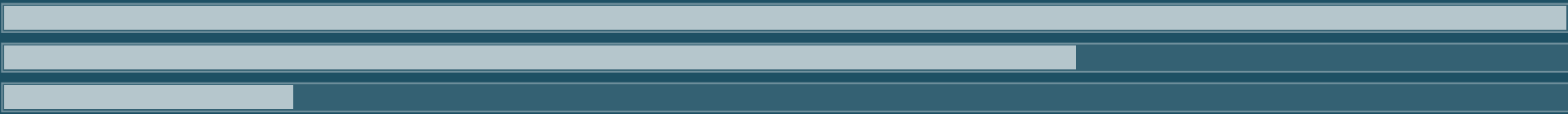
Shear Modulus



28 GPa

4.0 x 10⁶ psi

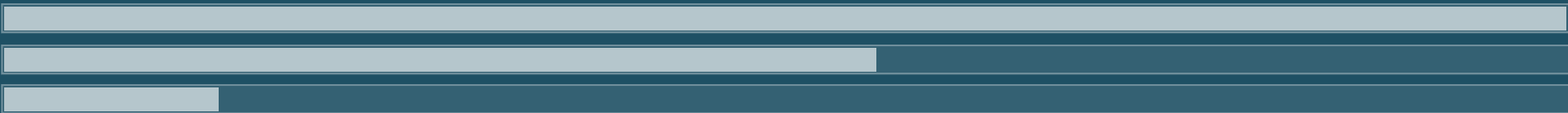
Shear Strength



260 MPa

38 x 10³ psi

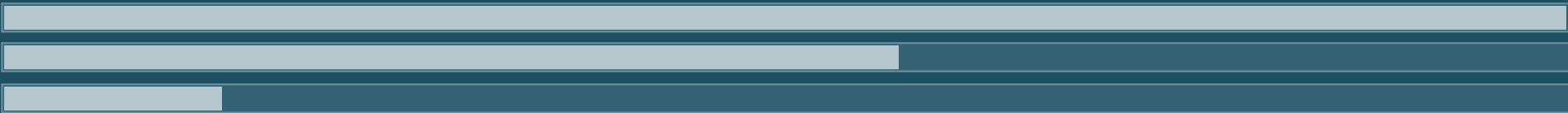
Tensile Strength: Ultimate (UTS)



390 MPa

56 x 10³ psi

Tensile Strength: Yield (Proof)

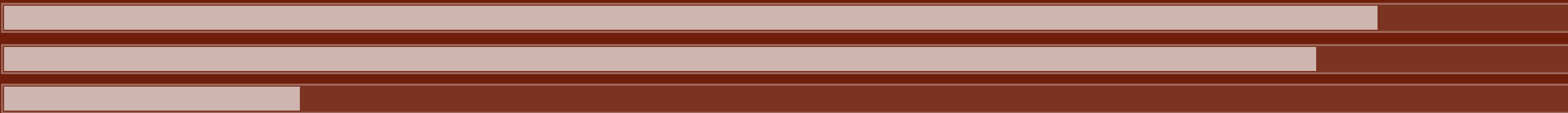


320 MPa

46 x 10³ psi

Thermal Properties

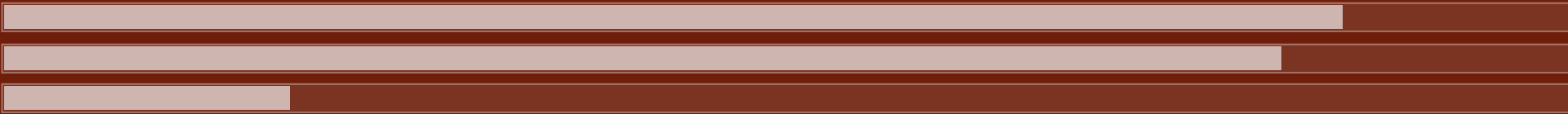
Melting Completion (Liquidus)



570 °C

1060 °F

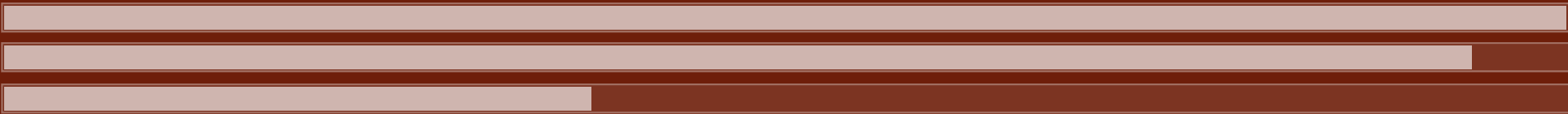
Melting Onset (Solidus)



530 °C

990 °F

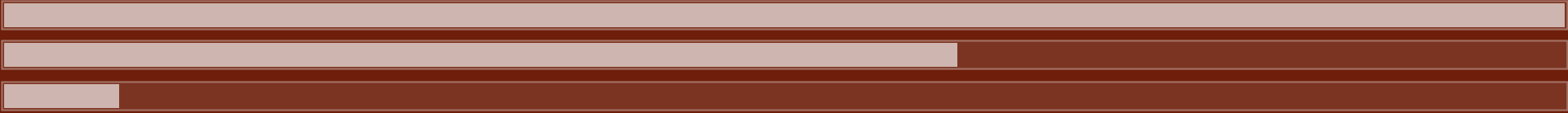
Specific Heat Capacity



900 J/kg-K

0.21 BTU/lb-°F

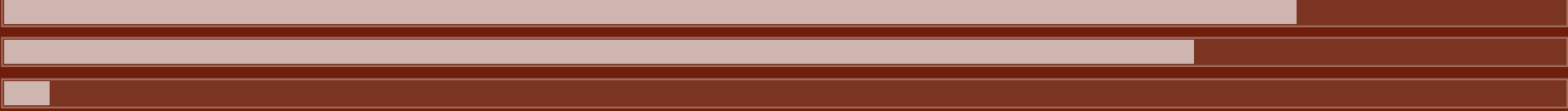
Thermal Conductivity



140 W/m-K

80 BTU/h-ft-°F

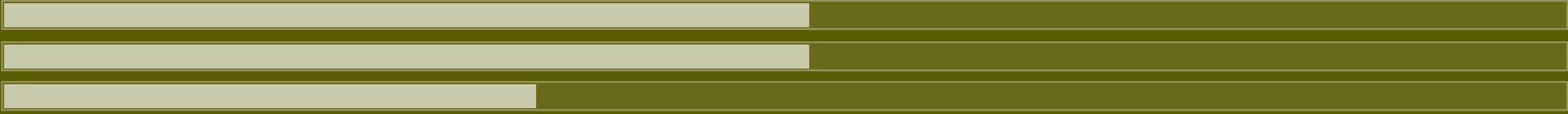
Thermal Expansion



19 μm/m-K

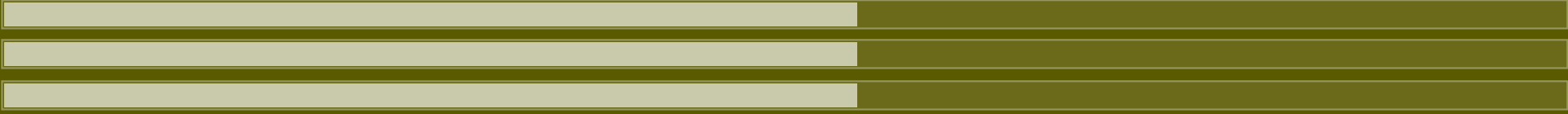
Electrical Properties

Electrical Conductivity: Equal Volume



34 % IACS

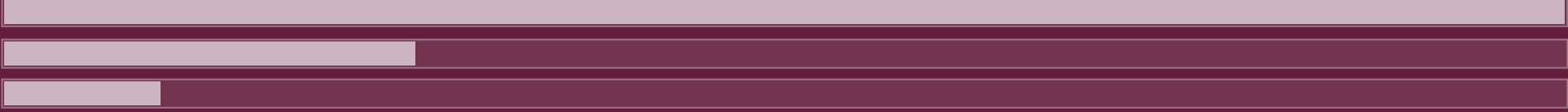
Electrical Conductivity: Equal Weight (Specific)



120 % IACS

Otherwise Unclassified Properties

Base Metal Price



10 % relative

Density



2.6 g/cm³

160 lb/ft³

Embodied Carbon



7.8 kg CO₂/kg material

Embodied Energy



140 MJ/kg

61 x 10³ BTU/lb

Embodied Water

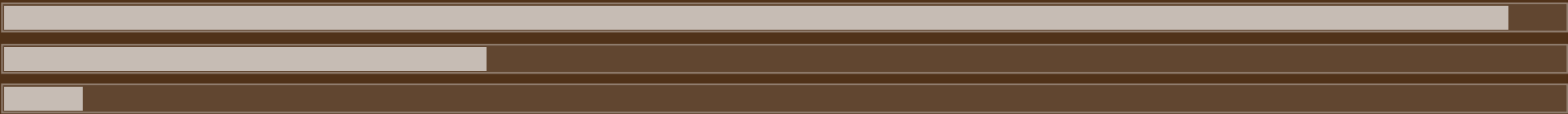


1030 L/kg

120 gal/lb

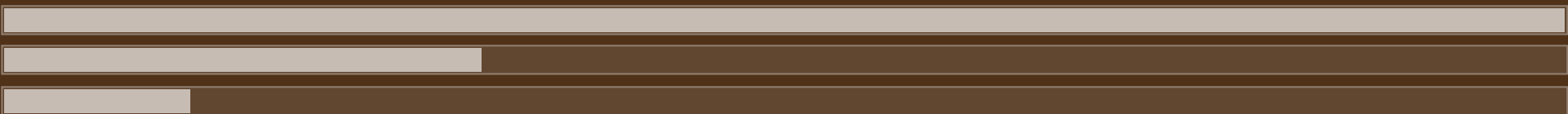
Common Calculations

Resilience: Ultimate (Unit Rupture Work)



25 MJ/m³

Resilience: Unit (Modulus of Resilience)



700 kJ/m³

Stiffness to Weight: Axial



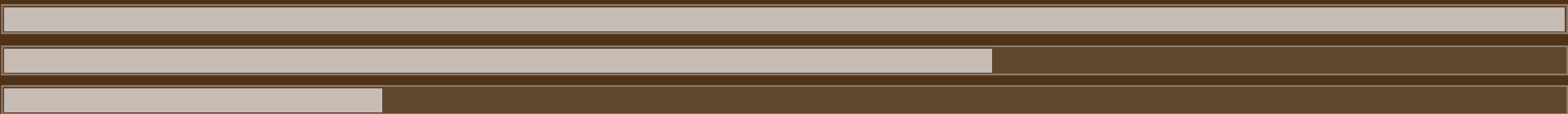
15 points

Stiffness to Weight: Bending



53 points

Strength to Weight: Axial



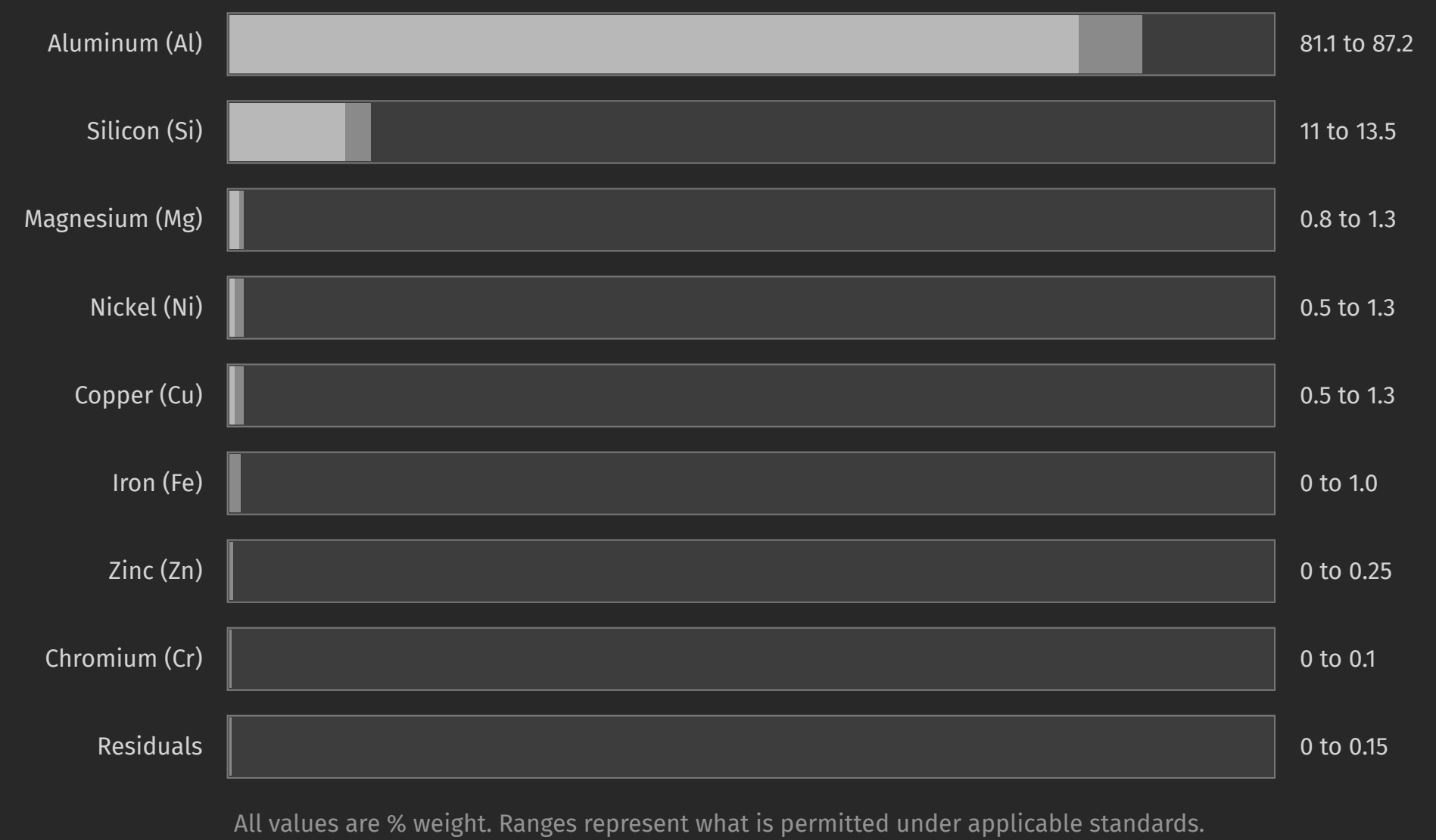
41 points

Strength to Weight: Bending



Alloy Composition

Among wrought aluminum alloys, the composition of 4032 aluminum is notable for containing a comparatively high amount of silicon (Si) and including nickel (Ni). Silicon is used to increase strength at the expense of ductility. It also lowers the melting temperature and raises the fluidity of the alloy. Nickel is used to increase mechanical strength at elevated temperatures, and to reduce thermal expansion. However, it can increase susceptibility to pitting corrosion in certain alloys.



Followup Questions

How are the material properties defined?