

Description

Image



Caption

1. Close-up of the material. © Granta Design 2. Red Sandstone, University of Sydney, New South Wales, Australia © Granta Design

The material

Sandstone is consolidated sand particles (quartz), bonded by a cementing agent: feldspars, limes, silica or clays. The size of the sand particles, the porosity and the strength vary greatly in different sandstones. The colors derive from iron or manganese impurities and give sandstones their character.

Composition (summary)

Silica (SiO₂) particles bonded with lime (CaO), calcium carbonate (CaCO₃) or clays (alumino-silicates).

General properties

Density	140	-	165	lb/ft ³
Price	* 0.186	-	0.281	USD/lb
Date first used	-10000			

Mechanical properties

Young's modulus	2.03	-	3.63	10 ⁶ psi
Shear modulus	* 0.812	-	1.45	10 ⁶ psi
Bulk modulus	* 1.6	-	2.9	10 ⁶ psi
Poisson's ratio	0.22	-	0.29	
Yield strength (elastic limit)	0.58	-	3.19	ksi
Tensile strength	0.58	-	3.19	ksi
Compressive strength	7.25	-	22.5	ksi
Elongation	0			% strain
Hardness - Vickers	7	-	38	HV
Fatigue strength at 10 ⁷ cycles	* 0.45	-	1.74	ksi
Fracture toughness	* 0.637	-	1	ksi.in ^{0.5}
Mechanical loss coefficient (tan delta)	* 0.0019	-	0.0057	

Thermal properties

Melting point	* 2.19e3	-	2.55e3	°F
Maximum service temperature	* 752	-	1.11e3	°F
Minimum service temperature	-459			°F
Thermal conductor or insulator?	Poor insulator			
Thermal conductivity	0.52	-	2.89	BTU.ft/h.ft ² .F
Specific heat capacity	* 0.201	-	0.22	BTU/lb.°F
Thermal expansion coefficient				

* 4.44 - 11.1 $\mu\text{strain}/^{\circ}\text{F}$

Electrical properties

Electrical conductor or insulator?

Good insulator

Electrical resistivity

1e10 - 1e14 $\mu\text{ohm.cm}$

Dielectric constant (relative permittivity)

* 6 - 9

Dissipation factor (dielectric loss tangent)

* 0.001 - 0.01

Dielectric strength (dielectric breakdown)

127 - 305 V/mil

Optical properties

Transparency

Opaque

Processability

Machinability

3 - 4

Eco properties

Embodied energy, primary production

43.3 - 65 kcal/lb

CO2 footprint, primary production

0.0269 - 0.0297 lb/lb

Recycle

✗

Supporting information

Design guidelines

Sandstone is easily cut and carved. Marble has a wonderful translucency, making it the choice of many sculptors. It weathers in a benign attractive way, but the surface traps dirt in an urban or industrial environment, requiring periodic cleaning.

Technical notes

Sandstones consist of particles of quartz, feldspar and mica bonded by a natural cement. The cement determines the strength, durability and color. Calcareous sandstones are bonded with calcium carbonate; they are called "freestone" because they are easily worked but they weather badly. Siliceous sandstones are bonded with alumino-silicates; they are acid resistant and durable but harder to work. Bluestone, much used in New York state, is noted for its even grain and high strength. It is about 70% silica bonded with clay. Ferruginous sandstones contain oxides of iron, giving lovely browns, reds and yellows.

Typical uses

Buildings and facing, table tops, bench tops and chemical equipment to resist acids and alkalis.

Tradenames

York stone; Bluestone

Links

Reference

ProcessUniverse

Producers