

## Description

### Image



### Caption

1. Close-up of the material. © John Fernandez 2. Cork, used to make wine bottle stoppers (corks). © Chris Lefteri 3. Cork is the bark of the cork oak, Quercus Suber. © Granta Design

### The material

Cork is a natural closed-cell foam, and is waterproof and remarkably stable, surviving in the neck of a wine bottle for 50 years or more without decay or contaminating the wine. Corkboard, made by compressing granulated cork under heat, is used for wall and ceiling insulation. Cork itself has a remarkable combination of properties. It is light yet resilient, insulates against heat and sound, has a high coefficient of friction, is impervious to liquids, chemically stable and fire resistant. Demand for cork exceeds 500,000 tonnes per year - and one tonne of cork has the same volume as 56 tonnes of steel.

### Composition (summary)

40% Suberin / 27% Lignin / 12% Cellulose / 4% Friedelin / 17% Water

## General properties

Density	7.49	-	15	lb/ft <sup>3</sup>
Price	* 1.22	-	6.08	USD/lb
Date first used	-3000			

## Mechanical properties

Young's modulus	0.00189	-	0.00725	10 <sup>6</sup> psi
Shear modulus	3.63e-4	-	0.00116	10 <sup>6</sup> psi
Bulk modulus	0.00145	-	0.00261	10 <sup>6</sup> psi
Poisson's ratio	0.05	-	0.45	
Yield strength (elastic limit)	* 0.0435	-	0.218	ksi
Tensile strength	0.0725	-	0.363	ksi
Compressive strength	0.0783	-	0.29	ksi
Elongation	20	-	80	% strain
Fatigue strength at 10 <sup>7</sup> cycles	0.0435	-	0.16	ksi
Fracture toughness	0.0455	-	0.091	ksi.in <sup>0.5</sup>
Mechanical loss coefficient (tan delta)	0.1	-	0.3	

## Thermal properties

Glass temperature	170	-	215	°F
Maximum service temperature	242	-	278	°F
Minimum service temperature	-99.7	-	-9.67	°F
Thermal conductor or insulator?	Good insulator			

Thermal conductivity	0.0202	-	0.0277	BTU.ft/h.ft^2.F
Specific heat capacity	0.454	-	0.502	BTU/lb.°F
Thermal expansion coefficient	72.2	-	128	µstrain/°F

## Electrical properties

Electrical conductor or insulator?	Poor insulator			
Electrical resistivity	* 1e9	-	1e11	µohm.cm
Dielectric constant (relative permittivity)	* 6	-	8	
Dissipation factor (dielectric loss tangent)	* 0.02	-	0.05	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

## Optical properties

Transparency	Opaque			
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## Processability

Moldability	3	-	4	
Machinability	4			

## Eco properties

Embodied energy, primary production	* 412	-	455	kcal/lb
CO2 footprint, primary production	* 0.181	-	0.2	lb/lb
Recycle	✗			

## Supporting information

### Design guidelines

The compressibility and great stability of cork, both in water and in oil, make it attractive for bottle stoppers, for gaskets and for packaging. It is easily cut and its fine cellular structure makes allows it to be carved to intricate shapes. Its vibration damping and thermal insulation qualities, together with its warm color and attractive texture give cork and products made from in (cork board, linoleum) a large market in floor, wall and ceiling coverings.

### Technical notes

Cork is used for stoppers and bungs for bottles; floats; life-belts; walls; flooring; insulation; shoes; packaging; fancy goods; decoration; gaskets; road surfaces; linoleum; polishing; brake pads; vibration damping.

### Typical uses

Corks; stoppers; bungs for bottles; floats; lifebelts; walls; flooring; insulation; shoes; packaging; fancy goods; decoration; gaskets; road surfaces; linoleum; polishing; brake pads; vibration damping.

## Links

Reference

ProcessUniverse

Producers