

## General information

### Designation

Dalbergia nigra (T)

### Typical uses

Veneer; decorative plywood; speciality items: cutlery handles; brush backs; billiard cue butts; fancy turnery articles, woodwind instruments.

## Composition overview

### Compositional summary

Cellulose/Hemicellulose/Lignin/12%H2O

Material family	Natural	
Base material	Wood (tropical)	
Renewable content	100	%

## Composition detail (polymers and natural materials)

Wood	100	%
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## Price

Price	* 3.04	- 4.88	USD/lb
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## Physical properties

Density	0.0289	- 0.0354	lb/in^3
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## Mechanical properties

Young's modulus	* 0.614	- 0.685	10^6 psi
Yield strength (elastic limit)	* 0.54	- 0.661	ksi
Tensile strength	* 0.899	- 1.1	ksi
Elongation	* 0.43	- 0.53	% strain
Compressive strength	* 1.65	- 2.02	ksi
Flexural modulus	0.558	- 0.622	10^6 psi
Flexural strength (modulus of rupture)	* 0.899	- 1.1	ksi
Shear modulus	* 0.0634	- 0.0872	10^6 psi
Shear strength	* 5.41	- 6.59	ksi
Rolling shear strength	* 0.2	- 0.599	ksi
Bulk modulus	* 0.305	- 0.341	10^6 psi
Poisson's ratio	* 0.02	- 0.04	
Shape factor	5.7		
Hardness - Vickers	* 9	- 11	HV
Hardness - Brinell	7.18	- 8.77	ksi
Hardness - Janka	* 2.02e3	- 2.47e3	lbf
Fatigue strength at 10^7 cycles	* 0.27	- 0.331	ksi
Mechanical loss coefficient (tan delta)	* 0.012	- 0.015	
Differential shrinkage (radial)	0.23	- 0.25	%
Differential shrinkage (tangential)	0.35	- 0.39	%
Radial shrinkage (green to oven-dry)	* 3.2	- 7	%
Tangential shrinkage (green to oven-dry)	* 6.8	- 11.5	%
Volumetric shrinkage (green to oven-dry)	* 11	- 18	%
Work to maximum strength	* 0.158	- 0.195	ft.lbf/in^3

## Impact & fracture properties

Fracture toughness	* 0.688	- 0.841	ksi.in^0.5
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### Thermal properties

Glass temperature	171	-	216	°F
Maximum service temperature	248	-	284	°F
Minimum service temperature	* -99.4	-	-9.4	°F
Thermal conductivity	* 0.0872	-	0.106	BTU.ft/hr.ft^2.°F
Specific heat capacity	0.396	-	0.408	BTU/lb.°F
Thermal expansion coefficient	* 20.2	-	26.6	μstrain/°F

### Electrical properties

Electrical resistivity	* 2.1e14	-	7e14	μohm.cm
Dielectric constant (relative permittivity)	* 4.78	-	5.85	
Dissipation factor (dielectric loss tangent)	* 0.07	-	0.085	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

### Optical properties

Transparency	Opaque
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### Magnetic properties

Magnetic type	Non-magnetic
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### Bio-data

RoHS (EU) compliant grades?	✓
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### Durability

Water (fresh)	Limited use
Water (salt)	Limited use
Weak acids	Limited use
Strong acids	Unacceptable
Weak alkalis	Acceptable
Strong alkalis	Unacceptable
Organic solvents	Acceptable
Oxidation at 500C	Unacceptable
UV radiation (sunlight)	Good
Flammability	Highly flammable

### Primary production energy, CO2 and water

Embodied energy, primary production	* 4.99e3	-	5.5e3	BTU/lb
CO2 footprint, primary production	* 0.574	-	0.633	lb/lb
NOx creation	0.00257	-	0.00284	lb/lb
SOx creation	0.00656	-	0.00725	lb/lb
Water usage	* 1.84e4	-	2.03e4	in^3/lb

### Processing energy, CO2 footprint & water

Coarse machining energy (per unit wt removed)	* 262	-	290	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.0458	-	0.0506	lb/lb
Fine machining energy (per unit wt removed)	* 785	-	867	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.137	-	0.151	lb/lb
Grinding energy (per unit wt removed)	* 1.37e3	-	1.51e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.238	-	0.263	lb/lb

### Recycling and end of life

Recycle	✗			
Recycle fraction in current supply	8.55	-	9.45	%
Downcycle	✓			

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Combust for energy recovery	✓			
Heat of combustion (net)	* 8.49e3	-	9.16e3	BTU/lb
Combustion CO2	* 1.69	-	1.78	lb/lb
Landfill	✓			
Biodegrade	✓			

### Eco-indicators for principal component

Eco-indicator 95	2.99			millipoints/lb
EPS value	62.7	-	69.3	

### Notes

#### Warning

All woods have properties which show variation; they depend principally on growth conditions and moisture content.

### Links

ProcessUniverse

Reference

Shape