

General information

Designation

Diospyros spp. (L)

Typical uses

Fancy articles; inlays; shuttles; turnery; piano keys; finger boards of stringed instruments; bowls.

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 | | % |
|------|-----|--|---|

Price

| | | | | |
|-------|--------|---|------|--------|
| Price | * 3.04 | - | 4.88 | USD/lb |
|-------|--------|---|------|--------|

Physical properties

| | | | | |
|---------|-------|---|--------|--------------------|
| Density | 0.034 | - | 0.0412 | lb/in ³ |
|---------|-------|---|--------|--------------------|

Mechanical properties

| | | | | |
|--|----------|---|--------|---------------------|
| Young's modulus | 1.41 | - | 1.73 | 10 ⁶ psi |
| Yield strength (elastic limit) | 3.77 | - | 4.61 | ksi |
| Tensile strength | * 16.6 | - | 20.3 | ksi |
| Elongation | * 4.77 | - | 5.83 | % strain |
| Compressive strength | 10.2 | - | 12.4 | ksi |
| Flexural modulus | 1.81 | - | 2.22 | 10 ⁶ psi |
| Flexural strength (modulus of rupture) | 17.9 | - | 21.9 | ksi |
| Shear modulus | * 0.104 | - | 0.128 | 10 ⁶ psi |
| Shear strength | 1.68 | - | 2.06 | ksi |
| Bulk modulus | * 0.467 | - | 0.526 | 10 ⁶ psi |
| Poisson's ratio | * 0.35 | - | 0.4 | |
| Shape factor | 5.5 | | | |
| Hardness - Vickers | * 16.2 | - | 19.8 | HV |
| Hardness - Brinell | 18 | - | 22 | ksi |
| Hardness - Janka | * 3.65e3 | - | 4.46e3 | lbf |
| Fatigue strength at 10 ⁷ cycles | * 5.37 | - | 6.56 | ksi |
| Mechanical loss coefficient (tan delta) | * 0.0064 | - | 0.0078 | |

| | | | | |
|--|--------|---|------|------------------------|
| Differential shrinkage (radial) | 0.24 | - | 0.3 | % |
| Differential shrinkage (tangential) | * 0.44 | - | 0.54 | % |
| Radial shrinkage (green to oven-dry) | * 3.2 | - | 7 | % |
| Tangential shrinkage (green to oven-dry) | 9.6 | - | 11.7 | % |
| Volumetric shrinkage (green to oven-dry) | 20.8 | - | 23.1 | % |
| Work to maximum strength | * 2.01 | - | 2.45 | ft.lbf/in ³ |

Impact & fracture properties

| | | | | |
|--------------------|--------|---|------|-----------------------|
| Fracture toughness | * 9.46 | - | 11.6 | ksi.in ^{0.5} |
|--------------------|--------|---|------|-----------------------|

Thermal properties

| | | | | |
|-------------------------------|---------|---|-------|-------------------------------|
| Glass temperature | 171 | - | 216 | °F |
| Maximum service temperature | 248 | - | 284 | °F |
| Minimum service temperature | * -99.4 | - | -9.4 | °F |
| Thermal conductivity | * 0.26 | - | 0.324 | BTU.ft/hr.ft ² .°F |
| Specific heat capacity | 0.396 | - | 0.408 | BTU/lb.°F |
| Thermal expansion coefficient | * 1.11 | - | 6.11 | µstrain/°F |

Electrical properties

| | | | | |
|--|---------|---|-------|---------|
| Electrical resistivity | * 6e13 | - | 2e14 | µohm.cm |
| Dielectric constant (relative permittivity) | * 10.1 | - | 12.4 | |
| Dissipation factor (dielectric loss tangent) | * 0.124 | - | 0.152 | |
| Dielectric strength (dielectric breakdown) | * 10.2 | - | 15.2 | V/mil |

Magnetic properties

| | |
|---------------|--------------|
| Magnetic type | Non-magnetic |
|---------------|--------------|

Optical properties

| | |
|--------------|--------|
| Transparency | Opaque |
|--------------|--------|

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 |
| Water usage | * 1.84e4 | - | 2.03e4 | in^3/lb |

Processing energy, CO2 footprint & water

| | | | | |
|---|----------|---|--------|--------|
| Coarse machining energy (per unit wt removed) | * 510 | - | 564 | BTU/lb |
| Coarse machining CO2 (per unit wt removed) | * 0.089 | - | 0.0984 | lb/lb |
| Fine machining energy (per unit wt removed) | * 3.27e3 | - | 3.61e3 | BTU/lb |
| Fine machining CO2 (per unit wt removed) | * 0.57 | - | 0.63 | lb/lb |
| Grinding energy (per unit wt removed) | * 6.33e3 | - | 6.99e3 | BTU/lb |
| Grinding CO2 (per unit wt removed) | * 1.1 | - | 1.22 | lb/lb |

Recycling and end of life

| | | | | |
|------------------------------------|----------|---|--------|--------|
| Recycle | ✗ | | | |
| Recycle fraction in current supply | 8.55 | - | 9.45 | % |
| Downcycle | ✓ | | | |
| Combust for energy recovery | ✓ | | | |
| Heat of combustion (net) | * 8.49e3 | - | 9.16e3 | BTU/lb |
| Combustion CO2 | * 1.69 | - | 1.78 | lb/lb |
| Landfill | ✓ | | | |
| Biodegrade | ✓ | | | |

Notes

Warning

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

Links

ProcessUniverse

Reference

Shape