General information

Designation

Acer saccharum

Typical uses

Lumber; veneer; sleepers; pulpwood; flooring; furniture; boxes; pallets & crates; shoe lasts; handles; woodenware; novelties; spools & bobbins.

Composition overview

Compositional summary

Cellulose/Hemicellulose/Lignin/12%H2O

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

Composition detail (polymers and natural materials)

Wood	100			%

Price

Price	* 0.608	-	0.912	USD/lb

Physical properties

Density	0.0231	-	0.0282	lb/in^3

Mechanical properties

Young's modulus	* 0.306	-	0.341	10^6 psi
Yield strength (elastic limit)	* 0.426	-	0.522	ksi
Tensile strength	* 0.711	-	0.87	ksi
Elongation	* 0.69	-	0.84	% strain
Compressive strength	1.32	-	1.62	ksi
Flexural modulus	0.278	-	0.31	10^6 psi
Flexural strength (modulus of rupture)	* 0.711	-	0.87	ksi
Shear modulus	* 0.0316	-	0.0434	10^6 psi
Shear strength	* 6.3	-	7.71	ksi
Rolling shear strength	* 0.234	-	0.701	ksi
Bulk modulus	* 0.157	-	0.174	10^6 psi
Poisson's ratio	* 0.02	-	0.04	
Shape factor	5.7			
Hardness - Vickers	5.8	-	7.09	HV
Hardness - Brinell	* 3.81	-	4.67	ksi
Hardness - Janka	1.3e3	-	1.59e3	lbf

Fatigue strength at 10^7 cycles	* 0.213	-	0.261	ksi
Mechanical loss coefficient (tan delta)	* 0.016	-	0.021	
Differential shrinkage (radial)	0.17	-	0.23	%
Differential shrinkage (tangential)	0.25	-	0.32	%
Radial shrinkage (green to oven-dry)	4.3	-	5.3	%
Tangential shrinkage (green to oven-dry)	8.9	-	10.9	%
Volumetric shrinkage (green to oven-dry)	13.2	-	16.2	%
Work to maximum strength	* 0.123	-	0.151	ft.lbf/in^3

Impact & fracture properties

Fracture toughness	* 0.485	-	0.593	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	0.0867	-	0.0982	BTU.ft/hr.ft^2.°F
Specific heat capacity	0.396	-	0.408	BTU/lb.°F
Thermal expansion coefficient	* 17.5	-	23.4	µstrain/°F

Electrical properties

Electrical resistivity	* 8.87e14	-	1.32e15	µohm.cm
Dielectric constant (relative permittivity)	* 3.93	-	4.8	
Dissipation factor (dielectric loss tangent)	* 0.054	-	0.067	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Bio-data

Food contact	Yes

Restricted substances risk indicators

RoHS (EU) compliant grades?	✓

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

Sources

0.5 MJ/kg (Ximenes, 2006); 2 MJ/kg (Ximenes, 2006); 9.1 MJ/kg (Hammond and Jones, 2008); 11.6 MJ/kg (Hubbard and Bowe, 2010); 23.7 MJ/kg (Ecoinvent v2.2); 26 MJ/kg (Ecoinvent v2.2)

CO2 footprint, primary production	0.574	-	0.633	lb/lb

Sources

0.229 kg/kg (Ecoinvent v2.2); 0.412 kg/kg (Ecoinvent v2.2); 0.862 kg/kg (Hammond and Jones, 2008); 0.909 kg/kg (Hubbard and Bowe,

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)	* 786	-	869	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.137	-	0.152	lb/lb
Grinding energy (per unit wt removed)	* 1.37e3	-	1.51e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.239	-	0.264	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	✓			

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

Maple (acer saccharinum) (t)

General information

Designation

Acer saccharinum

Typical uses

Lumber; veneer; sleepers; pulpwood; flooring; furniture; boxes; pallets & crates; shoe lasts; handles; woodenware; novelties; spools & bobbins.

Composition overview

Compositional summary

Cellulose/Hemicellulose/Lignin/12%H2O

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

Composition detail (polymers and natural materials)

Wood	100			%

Price

Price	* 0.608	-	0.912	USD/lb

Physical properties

Density	0.017	-	0.021	lb/in^3

Mechanical properties

Young's modulus	* 0.128	-	0.142	10^6 psi
Yield strength (elastic limit)	* 0.27	-	0.331	ksi
Tensile strength	0.45	-	0.551	ksi
Elongation	* 1.04	-	1.28	% strain
Compressive strength	0.666	-	0.814	ksi
Flexural modulus	0.116	-	0.129	10^6 psi
Flexural strength (modulus of rupture)	* 0.45	-	0.551	ksi
Shear modulus	* 0.0132	-	0.0181	10^6 psi
Shear strength	* 3.99	-	4.89	ksi
Rolling shear strength	* 0.148	-	0.445	ksi
Bulk modulus	* 0.0653	-	0.0725	10^6 psi
Poisson's ratio	* 0.02	-	0.04	
Shape factor	5.6			
Hardness - Vickers	2.8	-	3.43	HV
Hardness - Brinell	* 2.41	-	2.94	ksi
Hardness - Janka	629	-	771	lbf

Fatigue strength at 10^7 cycles	* 0.135	-	0.165	ksi
Mechanical loss coefficient (tan delta)	* 0.025	-	0.032	
Differential shrinkage (radial)	0.17	-	0.23	%
Differential shrinkage (tangential)	0.25	-	0.32	%
Radial shrinkage (green to oven-dry)	2.7	-	3.3	%
Tangential shrinkage (green to oven-dry)	6.5	-	7.9	%
Volumetric shrinkage (green to oven-dry)	10.8	-	13.2	%
Work to maximum strength	* 0.0616	-	0.0761	ft.lbf/in^3

Impact & fracture properties

Fracture toughness	* 0.313	-	0.382	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	0.0809	-	0.0924	BTU.ft/hr.ft^2.°F
Specific heat capacity	0.396	-	0.408	BTU/lb.°F
Thermal expansion coefficient	* 14.9	-	20.4	µstrain/°F

Electrical properties

Electrical resistivity	* 2.1e14	-	7e14	µohm.cm
Dielectric constant (relative permittivity)	* 3.12	-	3.81	
Dissipation factor (dielectric loss tangent)	* 0.04	-	0.049	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Bio-data

Food contact	Yes

Restricted substances risk indicators

RoHS (EU) compliant grades?	✓

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

Sources

0.5 MJ/kg (Ximenes, 2006); 2 MJ/kg (Ximenes, 2006); 9.1 MJ/kg (Hammond and Jones, 2008); 11.6 MJ/kg (Hubbard and Bowe, 2010); 23.7 MJ/kg (Ecoinvent v2.2); 26 MJ/kg (Ecoinvent v2.2)

CO2 footprint, primary production	0.574	-	0.633	lb/lb

Sources

0.229 kg/kg (Ecoinvent v2.2); 0.412 kg/kg (Ecoinvent v2.2); 0.862 kg/kg (Hammond and Jones, 2008); 0.909 kg/kg (Hubbard and Bowe,

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)	* 244	-	270	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.0425	-	0.047	lb/lb
Fine machining energy (per unit wt removed)	* 601	-	664	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.105	-	0.116	lb/lb
Grinding energy (per unit wt removed)	* 998	-	1.1e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.174	-	0.192	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	✓			

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

Maple (acer rubrum) (t)

General information

Designation

Acer rubrum

Typical uses

Lumber; veneer; sleepers; pulpwood; flooring; furniture; boxes; pallets & crates; shoe lasts; handles; woodenware; novelties; spools & bobbins.

Composition overview

Compositional summary

Cellulose/Hemicellulose/Lignin/12%H2O

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

Composition detail (polymers and natural materials)

Wood	100			%

Price

Price	* 0.608	-	0.912	USD/lb

Physical properties

Density	0.0195	-	0.0242	lb/in^3

Mechanical properties

Young's modulus	* 0.193	-	0.215	10^6 psi
Yield strength (elastic limit)	* 0.365	-	0.444	ksi
Tensile strength	* 0.609	-	0.74	ksi
Elongation	* 0.93	-	1.14	% strain
Compressive strength	0.901	-	1.1	ksi
Flexural modulus	0.175	-	0.196	10^6 psi
Flexural strength (modulus of rupture)	* 0.609	-	0.74	ksi
Shear modulus	* 0.0199	-	0.0273	10^6 psi
Shear strength	* 4.98	-	6.12	ksi
Rolling shear strength	* 0.186	-	0.555	ksi
Bulk modulus	* 0.0986	-	0.11	10^6 psi
Poisson's ratio	* 0.02	-	0.04	
Shape factor	5.6			
Hardness - Vickers	3.8	-	4.65	HV
Hardness - Brinell	* 3.06	-	3.76	ksi
Hardness - Janka	854	-	1.05e3	lbf

Fatigue strength at 10^7 cycles	* 0.183	-	0.222	ksi
Mechanical loss coefficient (tan delta)	* 0.021	-	0.026	
Differential shrinkage (radial)	0.17	-	0.23	%
Differential shrinkage (tangential)	0.25	-	0.32	%
Radial shrinkage (green to oven-dry)	3.6	-	4.4	%
Tangential shrinkage (green to oven-dry)	7.4	-	9	%
Volumetric shrinkage (green to oven-dry)	11.3	-	13.9	%
Work to maximum strength	* 0.0943	-	0.115	ft.lbf/in^3

Impact & fracture properties

Fracture toughness	* 0.385	-	0.47	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	* 0.0532	-	0.0647	BTU.ft/hr.ft^2.°F
Specific heat capacity	0.396	-	0.408	BTU/lb.°F
Thermal expansion coefficient	* 16	-	21.7	µstrain/°F

Electrical properties

Electrical resistivity	* 2.1e14	-	7e14	µohm.cm
Dielectric constant (relative permittivity)	* 3.47	-	4.24	
Dissipation factor (dielectric loss tangent)	* 0.046	-	0.057	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Bio-data

Food contact	Yes

Restricted substances risk indicators

RoHS (EU) compliant grades?	✓

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

Sources

0.5 MJ/kg (Ximenes, 2006); 2 MJ/kg (Ximenes, 2006); 9.1 MJ/kg (Hammond and Jones, 2008); 11.6 MJ/kg (Hubbard and Bowe, 2010); 23.7 MJ/kg (Ecoinvent v2.2); 26 MJ/kg (Ecoinvent v2.2)

CO2 footprint, primary production	0.574	-	0.633	lb/lb

Sources

0.229 kg/kg (Ecoinvent v2.2); 0.412 kg/kg (Ecoinvent v2.2); 0.862 kg/kg (Hammond and Jones, 2008); 0.909 kg/kg (Hubbard and Bowe,

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)	* 251	-	277	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.0438	-	0.0484	lb/lb
Fine machining energy (per unit wt removed)	* 670	-	741	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.117	-	0.129	lb/lb
Grinding energy (per unit wt removed)	* 1.14e3	-	1.26e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.198	-	0.219	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	✓			

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

Maple (acer nigrum) (t)

General information

Designation

Acer nigrum

Typical uses

Furniture; boxes; pallets; venetian blinds; sash; doors; veneer;

Composition overview

Compositional summary

Cellulose/Hemicellulose/Lignin/12%H2O

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

Composition detail (polymers and natural materials)

Wood		100		%

Price

Price	*	0.608	-	0.912	USD/lb

Physical properties

Density		0.0206	-	0.0253	lb/in^3

Mechanical properties

Young's modulus	*	0.226	-	0.252	10^6 psi
Yield strength (elastic limit)	*	0.365	-	0.444	ksi
Tensile strength		0.609	-	0.74	ksi
Elongation	*	0.8	-	0.97	% strain
Compressive strength		0.918	-	1.12	ksi
Flexural modulus		0.206	-	0.229	10^6 psi
Flexural strength (modulus of rupture)	*	0.609	-	0.74	ksi
Shear modulus	*	0.0234	-	0.0321	10^6 psi
Shear strength	*	4.91	-	6.01	ksi
Rolling shear strength	*	0.183	-	0.547	ksi
Bulk modulus	*	0.116	-	0.129	10^6 psi
Poisson's ratio	*	0.02	-	0.04	
Shape factor		5.6			
Hardness - Vickers		4.72	-	5.77	HV
Hardness - Brinell	*	3.18	-	3.87	ksi
Hardness - Janka		1.06e3	-	1.3e3	lbf
Fatigue strength at 10^7 cycles	*	0.183	-	0.222	ksi

Mechanical loss coefficient (tan delta)	* 0.019	-	0.024	
Differential shrinkage (radial)	0.17	-	0.23	%
Differential shrinkage (tangential)	0.25	-	0.32	%
Radial shrinkage (green to oven-dry)	4.3	-	5.3	%
Tangential shrinkage (green to oven-dry)	8.4	-	10.2	%
Volumetric shrinkage (green to oven-dry)	12.6	-	15.4	%
Work to maximum strength	* 0.0943	-	0.115	ft.lbf/in^3

Impact & fracture properties

Fracture toughness	* 0.418	-	0.511	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	* 0.0566	-	0.0693	BTU.ft/hr.ft^2.°F
Specific heat capacity	0.396	-	0.408	BTU/lb.°F
Thermal expansion coefficient	* 16.5	-	22.3	µstrain/°F

Electrical properties

Electrical resistivity	* 2.1e14	-	7e14	µohm.cm
Dielectric constant (relative permittivity)	* 3.62	-	4.42	
Dissipation factor (dielectric loss tangent)	* 0.049	-	0.06	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Bio-data

Food contact	Yes

Restricted substances risk indicators

RoHS (EU) compliant grades?	✓

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

Sources

0.5 MJ/kg (Ximenes, 2006); 2 MJ/kg (Ximenes, 2006); 9.1 MJ/kg (Hammond and Jones, 2008); 11.6 MJ/kg (Hubbard and Bowe, 2010); 23.7 MJ/kg (Ecoinvent v2.2); 26 MJ/kg (Ecoinvent v2.2)

CO2 footprint, primary production	0.574	-	0.633	lb/lb

Sources

0.229 kg/kg (Ecoinvent v2.2); 0.412 kg/kg (Ecoinvent v2.2); 0.862 kg/kg (Hammond and Jones, 2008); 0.909 kg/kg (Hubbard and Bowe,

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)	* 249	-	276	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.0435	-	0.0481	lb/lb
Fine machining energy (per unit wt removed)	* 657	-	726	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.115	-	0.127	lb/lb
Grinding energy (per unit wt removed)	* 1.11e3	-	1.23e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.194	-	0.214	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	✓			

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

Maple (acer macrophyllum) (t)

General information

Designation

Acer macrophyllum (T)

Typical uses

Furniture; boxes; pallets; venetian blinds; sash; doors; veneer;

Composition overview

Compositional summary

Cellulose/Hemicellulose/Lignin/12%H2O

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

Composition detail (polymers and natural materials)

Wood		100		%

Price

Price	*	0.608	-	0.912	USD/lb

Physical properties

Density		0.0173	-	0.0213	lb/in^3

Mechanical properties

Young's modulus	*	0.135	-	0.151	10^6 psi
Yield strength (elastic limit)	*	0.296	-	0.357	ksi
Tensile strength		0.493	-	0.595	ksi
Elongation	*	1.08	-	1.32	% strain
Compressive strength		0.674	-	0.825	ksi
Flexural modulus		0.123	-	0.138	10^6 psi
Flexural strength (modulus of rupture)	*	0.493	-	0.609	ksi
Shear modulus	*	0.0139	-	0.0191	10^6 psi
Shear strength	*	4.66	-	5.69	ksi
Rolling shear strength	*	0.173	-	0.518	ksi
Bulk modulus	*	0.0696	-	0.0783	10^6 psi
Poisson's ratio	*	0.02	-	0.04	
Shape factor		5.6			
Hardness - Vickers		3.4	-	4.16	HV
Hardness - Brinell	*	2.76	-	3.35	ksi
Hardness - Janka		764	-	935	lbf
Fatigue strength at 10^7 cycles	*	0.148	-	0.183	ksi

Mechanical loss coefficient (tan delta)	* 0.025	-	0.031	
Differential shrinkage (radial)	0.17	-	0.23	%
Differential shrinkage (tangential)	0.25	-	0.32	%
Radial shrinkage (green to oven-dry)	3.3	-	4.1	%
Tangential shrinkage (green to oven-dry)	6.4	-	7.8	%
Volumetric shrinkage (green to oven-dry)	10.4	-	12.8	%
Work to maximum strength	* 0.058	-	0.0713	ft.lbf/in^3

Impact & fracture properties

Fracture toughness	* 0.323	-	0.395	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	0.0867	-	0.104	BTU.ft/hr.ft^2.°F
Specific heat capacity	0.396	-	0.408	BTU/lb.°F
Thermal expansion coefficient	* 15.1	-	20.6	µstrain/°F

Electrical properties

Electrical resistivity	* 2.1e14	-	7e14	µohm.cm
Dielectric constant (relative permittivity)	* 3.17	-	3.87	
Dissipation factor (dielectric loss tangent)	* 0.041	-	0.05	
Dielectric strength (dielectric breakdown)	* 25.4	-	50.8	V/mil

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Bio-data

Food contact	Yes

Restricted substances risk indicators

RoHS (EU) compliant grades?	✓

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

Sources

0.5 MJ/kg (Ximenes, 2006); 2 MJ/kg (Ximenes, 2006); 9.1 MJ/kg (Hammond and Jones, 2008); 11.6 MJ/kg (Hubbard and Bowe, 2010); 23.7 MJ/kg (Ecoinvent v2.2); 26 MJ/kg (Ecoinvent v2.2)

CO2 footprint, primary production	0.574	-	0.633	lb/lb

Sources

0.229 kg/kg (Ecoinvent v2.2); 0.412 kg/kg (Ecoinvent v2.2); 0.862 kg/kg (Hammond and Jones, 2008); 0.909 kg/kg (Hubbard and Bowe,

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)	* 244	-	269	BTU/lb
Coarse machining CO2 (per unit wt removed)	* 0.0425	-	0.047	lb/lb
Fine machining energy (per unit wt removed)	* 599	-	662	BTU/lb
Fine machining CO2 (per unit wt removed)	* 0.104	-	0.115	lb/lb
Grinding energy (per unit wt removed)	* 994	-	1.1e3	BTU/lb
Grinding CO2 (per unit wt removed)	* 0.173	-	0.192	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	✓			

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