General information

Overview

Coir (from Malayalam kayar, cord) is a coarse fiber extracted from the fibrous outer shell of a coconut. The individual fiber cells are narrow and hollow, with thick walls made of cellulose. They are pale when immature but later become hardened and yellowed as a layer of lignin is deposited on their walls. There are two varieties of coir. White coir is harvested from the coconuts before they are ripe. The fibers are white or light brown in color and are smooth and fine. They are generally spun to make yarn that is used in mats or rope. Brown coir is harvested from fully ripened coconuts. It is thicker, stronger and has greater abrasion resistance than white coir. It is typically used in mats, brushes and sacking. The coir fiber is relatively water-proof and is one of the few natural fibers resistant to damage by salt water.

Designation

Coir

Typical uses

White coir is in used in rope making and, when woven, for matting. White coir also used to make fishing nets due to its excellent resistance to salt water.
Brown coir is used in floor mats and doormats, brushes, mattresses, floor tiles and sacking and twine. Pads of brown coir pads are sprayed with rubber latex, which bonds the fibers together (rubberized coir); it is used as upholstery padding in the automobile industry.

Composition overview

Compositional summary

Cellulose (C6-H10-O5)n

Form		Fiber		
Material family		Natural		
Base material		Cellulose		
Renewable content		100		%

Composition detail (polymers and natural materials)

Natural material		100		%

Price

Price	*	0.113	-	0.227	USD/lb
Price per unit volume	*	8.07	-	17	USD/ft^3

Physical properties

Density	0.0411	-	0.0434	lb/in^3

Mechanical properties

Young's modulus		0.58	-	1.31	10^6 psi
Yield strength (elastic limit)		14.5	-	21.8	ksi
Tensile strength		19	-	25.4	ksi
Elongation		15	-	40	% strain
Flexural modulus	*	0.58	-	1.31	10^6 psi

Flexural strength (modulus of rupture)		19.6	-	34.8	ksi
Shear modulus	*	0.21	-	0.315	10^6 psi
Poisson's ratio	*	0.383	-	0.393	
Shape factor		1			
Fatigue strength at 10^7 cycles	*	7.83	-	13.9	ksi
Mechanical loss coefficient (tan delta)	*	0.0106	-	0.0139	

Impact & fracture properties

Fracture toughness		3.03	-	10.2	ksi.in^0.5

Thermal properties

Thermal expansion coefficient		20.8	-	27.4	µstrain/°F

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Critical materials risk

Contains >5wt% critical elements?	No

Absorption & permeability

Water absorption @ 24 hrs	*	1.8	-	2.2	%
Water absorption @ sat		9	-	11	%
Humidity absorption @ sat	*	3	-	3.67	%

Durability

Water (fresh)	Excellent
Water (salt)	Excellent
Weak acids	Acceptable
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	*	4.09e3	-	4.51e3	BTU/lb
CO2 footprint, primary production	*	1.52	-	1.68	lb/lb

Water usage	* 6.09e4	-	6.75e4	in^3/lb

Processing energy, CO2 footprint & water

Fabric production energy	* 1.07e3	-	1.17e3	BTU/lb
Fabric production CO2	* 0.198	-	0.218	lb/lb
Fabric production water	* 28.5	-	42.9	in^3/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)	* 6.1e3	-	6.41e3	BTU/lb
Combustion CO2	* 1.39	-	1.46	lb/lb
Landfill	✓			
Biodegrade	✓			

Links

ProcessUniverse

Reference

Shape