

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		%
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Price

Price	* 0.25	-	0.5	USD/kg
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Physical properties

Density	1.14e3	-	1.2e3	kg/m ³
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Mechanical properties

Young's modulus	4	-	9	GPa
Yield strength (elastic limit)	100	-	150	MPa
Tensile strength	131	-	175	MPa
Elongation	15	-	40	% strain
Flexural modulus	* 4	-	9	GPa
Flexural strength (modulus of rupture)	135	-	240	MPa

Shear modulus	* 1.45	-	2.17	GPa
Poisson's ratio	* 0.383	-	0.393	
Shape factor	1			
Fatigue strength at 10 ⁷ cycles	* 54	-	96	MPa
Mechanical loss coefficient (tan delta)	* 0.0106	-	0.0139	

Impact & fracture properties

Fracture toughness	3.33	-	11.3	MPa.m ^{0.5}
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Thermal properties

Thermal expansion coefficient	37.4	-	49.3	μstrain/°C
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Magnetic properties

Magnetic type	Non-magnetic			
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Optical properties

Transparency	Opaque			
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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	* 9.52	-	10.5	MJ/kg
CO2 footprint, primary production	* 1.52	-	1.68	kg/kg
Water usage	* 2.2e3	-	2.44e3	l/kg

Processing energy, CO2 footprint & water

Fabric production energy	* 2.48	-	2.73	MJ/kg
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Fabric production CO2	* 0.198	-	0.218	kg/kg
Fabric production water	* 1.03	-	1.55	l/kg

Recycling and end of life

Recycle	✗			
Recycle fraction in current supply	8.55	-	9.45	%
Downcycle	✓			
Combust for energy recovery	✓			
Heat of combustion (net)	* 14.2	-	14.9	MJ/kg
Combustion CO2	* 1.39	-	1.46	kg/kg
Landfill	✓			
Biodegrade	✓			

Links

ProcessUniverse
Reference
Shape