

## 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)<sub>n</sub>

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	* 0.113	-	0.227	USD/lb
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## Physical properties

Density	0.0411	-	0.0434	lb/in <sup>3</sup>
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## Mechanical properties

Young's modulus	0.58	-	1.31	10 <sup>6</sup> 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 <sup>6</sup> psi
Flexural strength (modulus of rupture)	19.6	-	34.8	ksi
Shear modulus	* 0.21	-	0.315	10 <sup>6</sup> psi
Poisson's ratio	* 0.383	-	0.393	
Fatigue strength at 10 <sup>7</sup> 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 <sup>0.5</sup>
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## Thermal properties

Thermal expansion coefficient	20.8	-	27.4	μstrain/°F
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## Magnetic properties

Magnetic type

Non-magnetic

## Bio-data

RoHS (EU) compliant grades?

✓

## 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

NOx creation

0.00257 - 0.00284 lb/lb

SOx creation

0.00656 - 0.00725 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

✓

## Geo-economic data for principal component

Principal component

Coir

Annual world production

1.03e6 - 1.14e6 ton/yr

### Main mining areas (metric tonnes per year)

Bangladesh, Ghana, India, Malaysia, Sri Lanka, Thailand, Vietnam

## Eco-indicators for principal component

Eco-indicator 95

2.99 millipoints/lb

EPS value

62.7 - 69.3

## Links

ProcessUniverse

Reference

Shape