

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 | * 0.25 | - | 0.5 | USD/kg |
| Price per unit volume | * 285 | - | 600 | USD/m^3 |

Physical properties

| | | | | |
|---------|--------|---|-------|--------|
| Density | 1.14e3 | - | 1.2e3 | kg/m^3 |
|---------|--------|---|-------|--------|

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} |
|--------------------|------|---|------|----------------------|

Thermal properties

| | | | | |
|-------------------------------|------|---|------|------------|
| Thermal expansion coefficient | 37.4 | - | 49.3 | μstrain/°C |
|-------------------------------|------|---|------|------------|

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 | * 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 |
| 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 |