General information

Overview

Jute is a long, soft, shiny vegetable fiber made from plants in the genus Corchorus, family Malvaceae. Like kenaf, industrial hemp, flax (linen) and ramie, jute is a bast fiber plant, one in which the fibers extracted from the stem or bast. Jute is one of the cheapest natural fibers and is second only to cotton in amount produced and variety of uses. It can be spun into coarse, strong threads. When woven it is called hessian or burlap. There is growing interest in using jute as reinforcement in composites, replacing glass.

Designation

Jute

Typical uses

Jute is used chiefly to make cloth for wrapping bales of raw cotton, and to make sacks and coarse cloth. The fibers are also woven into curtains, chair coverings, carpets, area rugs, hessian cloth, and backing for linoleum.

Composition overview

Compositional summary

Jute fibers are composed primarily of cellulose and lignin

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

Composition detail (polymers and natural materials)

Natural material		100		%

Price

Price	*	0.35	- 1.5	USD/kg
Price per unit volume	*	455	- 2.25e3	USD/m^3

Physical properties

Density		1.3e3	- 1.5e3	kg/m^3

Mechanical properties

Young's modulus		13	- 60	GPa
Yield strength (elastic limit)		145	- 530	MPa
Tensile strength		240	- 860	MPa
Elongation		1.16	- 1.8	% strain
Flexural modulus	*	13	- 60	GPa
Shear modulus	*	13	- 22.2	GPa
Poisson's ratio	*	0.343	- 0.357	
Shape factor		1		
Fatigue strength at 10^7 cycles	*	160	- 344	MPa

Mechanical loss coefficient (tan delta)	* 0.00226	-	0.00325	

Impact & fracture properties

Fracture toughness	0.701	-	16.1	MPa.m^0.5

Thermal properties

Glass temperature	* 380	-	390	℃
Maximum service temperature	* 400	-	420	℃
Thermal conductivity	* 0.25	-	0.35	W/m.℃
Specific heat capacity	1.2e3	-	1.22e3	J/kg.℃
Thermal expansion coefficient	* 15	-	30	µstrain/℃

Magnetic properties

Magnetic type	Non-magnetic

Optical properties

Transparency	Opaque

Critical materials risk

Contains >5wt% critical elements?	No

Absorption & permeability

Water absorption @ 24 hrs	* 2.2	-	2.6	%
Water absorption @ sat	11	-	13	%
Humidity absorption @ sat	* 3.67	-	4.33	%

Durability

Water (fresh)	Acceptable
Water (salt)	Limited use
Weak acids	Limited use
Strong acids	Unacceptable
Weak alkalis	Limited use
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	63.8	-	70.3	MJ/kg
Sources: 61.9 MJ/kg (Ecoinvent v2.2); 72 MJ/kg (Ecoinvent v2.2)				
CO2 footprint, primary production	2.69	-	2.96	kg/kg

Sources
2.58 kg/kg (Ecoinvent v2.2); 3.06 kg/kg (Ecoinvent

Water usage	* 2.55e3	-	2.82e3	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)	* 16.9	-	17.7	MJ/kg
Combustion CO2	* 1.39	-	1.46	kg/kg
Landfill	✓			
Biodegrade	✓			

Links

ProcessUniverse

Reference

Shape