Jute

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	*	0.159	-	0.68	USD/lb

Physical properties

Density		0.047	-	0.0542	lb/in^3

Mechanical properties

Young's modulus		1.89	-	8.7	10^6 psi
Yield strength (elastic limit)		21	-	76.9	ksi
Tensile strength		34.7	-	125	ksi
Elongation		1.16	-	1.8	% strain
Flexural modulus	*	1.89	-	8.7	10^6 psi
Shear modulus	*	1.88	-	3.23	10^6 psi
Poisson's ratio	*	0.343	-	0.357	
Fatigue strength at 10^7 cycles	*	23.2	-	49.9	ksi
Mechanical loss coefficient (tan delta)	*	0.00226	-	0.00325	

Impact & fracture properties

Fracture toughness		0.638	-	14.6	ksi.in^0.5

Thermal properties

Glass temperature	*	716	-	734	°F
Maximum service temperature	*	752	-	788	°F
Thermal conductivity	*	0.144	-	0.202	BTU.ft/hr.ft^2.°F
Specific heat capacity		0.287	-	0.291	BTU/lb.°F
Thermal expansion coefficient	*	8.33	-	16.7	µstrain/°F

Magnetic properties

Magnetic type	Non-magnetic			

Bio-data

RoHS (EU) compliant grades?	✓			

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	2.74e4	-	3.02e4	BTU/lb
Sources				
61.9 MJ/kg (Ecoinvent v2.2); 72 MJ/kg (Ecoinvent v2.2)				
CO2 footprint, primary production	2.69	-	2.96	lb/lb
Sources				
2.58 kg/kg (Ecoinvent v2.2); 3.06 kg/kg (Ecoinvent v2.2)				
NOx creation	0.00257	-	0.00284	lb/lb
SOx creation	0.00656	-	0.00725	lb/lb
Water usage	* 7.06e4	-	7.81e4	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)	* 7.25e3	-	7.61e3	BTU/lb
Combustion CO2	* 1.39	-	1.46	lb/lb
Landfill	✓			
Biodegrade	✓			

Geo-economic data for principal component

Principal component	Jute			
Annual world production	2.76e6	-	3.05e6	ton/yr

Main mining areas (metric tonnes per year)

Bangladesh, China, India, Nepal, Uzbekistan

Eco-indicators for principal component

Eco-indicator 95	2.99			millipoints/lb
EPS value	62.7	-	69.3	

Links

ProcessUniverse

Reference

Shape