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General information

Overview

Sisal fiber is derived from an agave, Agave sisalana. Sisal is valued for cordage use because of its strength, durability, ability to stretch, affinity for certain dyestuffs, and resistance to deterioration in

Designation

Sisal

Typical uses

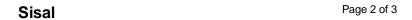
Sisal is used by industry in three grades, according to www.sisal.ws. The lower grade fiber is processed by the paper industry because of its high content of cellulose and hemicelluloses. The medium grade fiber is used in the cordage industry for making: ropes, baler and binders twine. Ropes and twines are widely employed for marine, agricultural, and general industrial use. The higher-grade fiber after treatment is converted into yarns and used by the carpet industry.

Sisall is now used as a reinforcement in polymer-matrix composites.

Composition overview

Compositional summary

Cellulose 70 wt% and lignin 12 wt %.						
Form		Fiber				
Material family		Natural				
Base material		Cellulose				
Renewable content		100			%	
Composition detail (polymers and na	atural materials	5)				
Natural material		100			%	
Price						
Price		* 0.272	-	0.318	USD/lb	
Physical properties						
Density		0.0522	-	0.0542	lb/in^3	
Mechanical properties						
Young's modulus		1.36	-	3.19	10^6 psi	
Yield strength (elastic limit)		* 66.7	-	83.5	ksi	
Tensile strength		74.1	-	92.8	ksi	
Elongation		2	-	7	% strain	
Flexural modulus		* 1.36	-	3.19	10^6 psi	
Shear modulus		* 0.532	-	1.33	10^6 psi	
Poisson's ratio		* 0.359	-	0.374		
Shape factor		1				
Fatigue strength at 10^7 cycles		* 31.9	-	45.8	ksi	





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Mechanical loss coefficient (tan delta)	* 0.00407 - 0.00753				
Impact & fracture properties					
Fracture toughness	17.8 - 92 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				
Optical properties					
Transparency	Opaque				
Restricted substances risk indicators					
RoHS (EU) compliant grades?	✓				
(10) (10) compliant glades	•				
Absorption & permeability					
Water absorption @ 24 hrs	* 2 - 2.4 %				
Water absorption @ sat	10 - 12 %				
Humidity absorption @ sat	* 3.33 - 4 %				
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					
Primary production energy, CO2 and wate Embodied energy, primary production	* 4.09e3 - 4.51e3 BTU/lb				
CO2 footprint, primary production	* 1.52 - 1.68 lb/lb				
NOx creation	1.02 - 1.00 ID/ID				
	0.00257 - 0.00284 lb/lb				



SOx creation	0.00656	-	0.00725	lb/lb
Water usage	* 2.18e5	-	2.41e5	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)	* 8.28e3 - 8.7e3 BTU/lb
Combustion CO2	* 1.5 - 1.58 lb/lb
Landfill	✓
Biodegrade	✓

Geo-economic data for principal component

Principal component	Sisal			
Annual world production, principal component	3.57e5	-	3.94e5	ton/yr

Main mining areas (metric tonnes per year)

Brazil, China, Haiti, Kenya, Madagascar, Mexico, Morocco, United Republic of Tanzania, Venezuela

Eco-indicators for principal component

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

Links

ProcessUniverse			
Reference			
Shape			