Cotton

General information

Designation

Cotton

Typical uses

Fabric and ropes; bandages.

Composition overview

Compositional summary

Cellulose(C6H10O5)n/12% H20

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

Composition detail (polymers and natural materials)

Natural material	100			%

Price

Price	* 0.939	-	1.88	USD/lb

Physical properties

Density	0.0542	-	0.0578	lb/in^3

Mechanical properties

Young's modulus	0.798	-	4.06	10^6 psi
Yield strength (elastic limit)	14.5	-	50.8	ksi
Tensile strength	41.6	-	86.6	ksi
Elongation	7	-	8	% strain
Flexural modulus	* 0.798	-	4.06	10^6 psi
Shear modulus	0.145	-	0.305	10^6 psi
Bulk modulus	* 0.29	-	0.87	10^6 psi
Poisson's ratio	* 0.25	-	0.3	
Shape factor	1			
Mechanical loss coefficient (tan delta)	* 0.01	-	0.05	

Impact & fracture properties

Fracture toughness	* 0.91	-	1.82	ksi.in^0.5

Thermal properties

Glass temperature	230	-	266	°F
Maximum service temperature	230	-	266	°F
Minimum service temperature	-459			°F
Thermal conductivity	* 0.116	-	0.173	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

Electrical properties

Electrical resistivity	* 1e14	-	1e16	µohm.cm
Dielectric constant (relative permittivity)	3	-	6	
Dissipation factor (dielectric loss tangent)	* 0.003	-	0.02	
Dielectric strength (dielectric breakdown)	152	-	203	V/mil

Optical properties

Transparency	Opaque

Magnetic properties

Magnetic type	Non-magnetic

Bio-data

RoHS (EU) compliant grades?	✓

Durability

Water (fresh)	Acceptable
Water (salt)	Acceptable
Weak acids	Limited use
Strong acids	Unacceptable
Weak alkalis	Acceptable
Strong alkalis	Limited use
Organic solvents	Acceptable
Oxidation at 500C	Unacceptable
UV radiation (sunlight)	Fair
Flammability	Highly flammable

Primary production energy, CO2 and water

Embodied energy, primary production	1.86e4	-	2.06e4	BTU/lb

Sources

13 MJ/kg (Barber and Pellow, 2006); 26 MJ/kg (Barber and Pellow, 2006); 29 MJ/kg (Barber and Pellow, 2006); 49 MJ/kg (Shen and Patel, 2008); 50 MJ/kg (Shen and Patel, 2008); 54 MJ/kg (Barber and Pellow, 2006); 55 MJ/kg (Polartec); 59 MJ/kg (Shen and Patel, 2008); 60 MJ/kg (Shen and Patel, 2008); 60 MJ/kg (Barber and Pellow, 2006)

CO2 footprint, primary production	* 0.851	-	0.938	lb/lb
NOx creation	* 0.0258	-	0.0285	lb/lb
SOx creation	* 0.0441	-	0.0487	lb/lb
Water usage	* 2.04e5	-	2.26e5	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	0.1			%
Downcycle	✓			
Combust for energy recovery	✓			
Heat of combustion (net)	* 7.31e3	-	7.68e3	BTU/lb
Combustion CO2	* 1.39	-	1.46	lb/lb
Landfill	✓			
Biodegrade	✓			

Geo-economic data for principal component

Principal component	Cotton			
Annual world production	2.5e7	-	2.77e7	ton/yr

Main mining areas (metric tonnes per year)

Australia, Brazil, China, India, Pakistan, United States, Uzbekistan

Eco-indicators for principal component

EPS value

963 - 1.06e3

Notes

Other notes

Cotton is a cellulose material. This record refers to natural cotton fibers in the unwoven state.

Links

ProcessUniverse

Reference

Shape