Polyisoprene rubber (IIR)

Description

Image

Caption

Isoprene is used for seals, tubing, vibration mounts, grips etc.

The material

Isoprene (or Polyisoprene) is synthetic natural rubber, and is processed in the same way as natural rubber. It has low hysteresis and high tear resistance, making it bouncy and tough.

Composition (summary)

(CH2-C(CH3)-CH-CH2)n

General properties

Density		58.1	-	58.7	lb/ft^3
Price	*	1.46	-	1.61	USD/lb
Date first used		1960			

Mechanical properties

Young's modulus		2.03e-4	-	5.8e-4	10^6 psi
Shear modulus		5.8e-5	-	8.7e-5	10^6 psi
Bulk modulus		0.21	-	0.225	10^6 psi
Poisson's ratio		0.499	-	0.5	
Yield strength (elastic limit)		2.9	-	3.63	ksi
Tensile strength		2.9	-	3.63	ksi
Compressive strength		3.34	-	3.63	ksi
Elongation		500	-	550	% strain
Fatigue strength at 10^7 cycles	*	0.5	-	1.02	ksi
Fracture toughness		0.0637	-	0.091	ksi.in^0.5
Mechanical loss coefficient (tan delta)	*	0.82	-	2	

Thermal properties

Glass temperature		-118	-	-109	°F
Maximum service temperature		206	-	242	°F
Minimum service temperature		-63.7	-	-45.7	°F
Thermal conductor or insulator?		Good insulator			
Thermal conductivity		0.0462	-	0.0809	BTU.ft/h.ft^2.F
Specific heat capacity		0.43	-	0.597	BTU/lb.°F
Thermal expansion coefficient		83.3	-	250	µstrain/°F

Electrical properties

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Electrical conductor or insulator?		Good insulator			
Electrical resistivity		1e15	-	1e16	µohm.cm
Dielectric constant (relative permittivity)	*	2.5	-	3	
Dissipation factor (dielectric loss tangent)		2e-4	-	0.002	
Dielectric strength (dielectric breakdown)		406	-	584	V/mil

Optical properties

Transparency		Translucent			
Refractive index		1.51	-	1.53	

Processability

Castability		4	-	5	
Moldability		4	-	5	
Machinability		3	-	4	
Weldability		1			

Eco properties

Embodied energy, primary production	*	1.07e4	-	1.19e4	kcal/lb
CO2 footprint, primary production	*	5.11	-	5.65	lb/lb
Recycle		✗			

Supporting information

Design guidelines

Isoprene has low hysteresis and high tear resistance, making it bouncy and tough.

Typical uses

Car tires and inner tubes, seals, belts, anti-vibration mounts, electrical insulation, tubing, rubber lining pipes and pumps, shoes.

Links

Reference

ProcessUniverse

Producers