PDCPD polydicyclopentadiene

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	polydicyclopentadiene	
SYNTHESIS			
Method of synthesis	-	ring opening methathesis polymerization of dicyclopentadiene	
Catalyst	-	2nd generation Grubbs catalyst (cure)	Rhode, B J; Robertson, M L; Krishnamoorti, R, Polymer, 69, 204-14, 2015.
COMMERCIAL POLYMERS			
Some manufacturers	-	Materia, Inc; Rimtec Co.	
Trade names	-	Proxima; Telene	
PHYSICAL PROPERTIES			
Density at 20°C	g cm^{-3}	1.03-1.05; 0.97 (liquid)	
Decomposition temperature	°C	450 (TGA)	Gottschalk, D, M. Sc. Thesis, Iowa State UNiversity, 2011.
Thermal expansion coefficient, -40 to 40°C	$°C^{-1}$	79E-06	
Thermal conductivity, melt	W m^{-1} K^{-1}	0.17	Le Gac, P Y; Choqueuse, D; Paris, M; Recher, M; Zimmer, C; Melot, D, Polym. Deg. Stab., 98, 809-17, 2013.
Glass transition temperature	°C	124-255 (DMA)	Vallons, K A M, Drozdzak, R; Charret, M; Lomov, S V; Verpoest, I, Compos. Part A, 78, 191-200, 2015.
Maximum service temperature	°C	180	
Heat deflection temperature at 0.45 MPa	°C	105-118	
Relative permittivity at 1 MHz	-	2.75-3.02 (depending on catalyst used)	Gottschalk, D, M. Sc. Thesis, Iowa State UNiversity, 2011.
Coefficient of friction	-	0.7	Pan, B; Zhao, J; Zhang, Y; Zhang, Y, IERI Procedia, 1, 19-24, 2012.
MECHANICAL & RHEOLOGICAL PROPERTIES			
Tensile strength	MPa	35-73	Vallons, K A M, Drozdzak, R; Charret, M; Lomov, S V; Verpoest, I, Compos. Part A, 78, 191-200, 2015.
Tensile modulus	MPa	1770-3,100	Knorr, D B; Masser, K A; Elder, R M; Sirk, T W; Hindenlang, M D; Yu, J H; Richardson D A; Boyd, S E; Spurgeon, W A; Lenhart, J L, Compos. Sci. Technol., 114, 17-25, 2015.
Tensile stress at yield	MPa	52.4	
Elongation	%	2.7	Hu, Y; Lang, A W; Li, X; Nutt, S R, Polym. Deg. Stab., 110, 465-72, 2014.
Tensile yield strain	%	4-5	
Flexural strength	MPa	67-75 (yield)	
Flexural modulus	MPa	1,850-2,000	
Elastic modulus	MPa	1,870-1,980	
Fracture toughness	MPa $m^{1/2}$	3.3	Gottschalk, D, M. Sc. Thesis, Iowa State UNiversity, 2011.

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PARAMETER	UNIT	VALUE	REFERENCES
Charpy impact strength, notched, 23°C	kJ m^{-2}	118	
Izod impact strength, notched, 23°C	kJ m^{-1}	22-30	
Shear modulus	MPa	680-710	
Poisson's ratio	-	0.39	
Rockwell hardness	-	R114	
Water absorption, equilibrium in water at 23°C	%	1	
FLAMMABILITY			
Flammability according to UL-standard; thickness 1.6/0.8 mm	class	HB to V-0	
PROCESSING			
Typical processing methods	-	cure, RIM	
Processing temperature	°C	120	
Process time	min	60	
Post-cure	min	60 @ 190°C	
Additives used in final products	-	organic photoredox mediators	Goetz, A E; Boydston, A J, J. Am. Chem. Sco., 137, 24, 7572-5, 2015.
Applications	-	agricultural and construction equipment, trucks and buses (body panels), the chlor-alkali industry (electrolyzer cell covers or butterfly valves), containers (wastewater systems, waste containers, military boxes)	
ANALYSIS			
FTIR (wavenumber-assignment)	cm^{-1}/-	trans C=C-H bending ´974; cis C=C-H bending ´754, 735	Rhode, B J; Robertson, M L; Krishnamoorti, R, Polymer, 69, 204-14, 2015.
^{13}C NMR (chemical shifts)	ppm	C6 ´35; C4 ´42; C2+C3 ´46; C5 ´55; carbon double bond 131	Le Gac, P Y; Choqueuse, D; Paris, M; Recher, M; Zimmer, C; Melot, D, Polym. Deg. Stab., 98, 809-17, 2013.