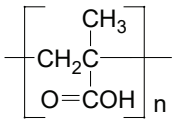
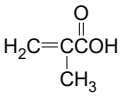
PMAA poly(methacrylic acid)

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	poly(methacrylic acid)	
CAS name	-	2-propenoic acid, 2-methyl-, homopolymer	
Acronym	-	PMAA	
CAS number	-	25087-26-7	
Formula			
HISTORY			
Person to discover	-	Strain, D E	Strain, D E, US Patent 2,133,257, DuPont, Oct. 11, 1938.
Date	-	1938	
Details	-	polymerization conducted in the presence of emulsifying agent and initiator	
SYNTHESIS			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	79-41-4	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	86.06	
Monomer ratio	-	100%	
Method of synthesis	-	free radical bulk polymerization in the presence of benzoyl peroxide	Vinu, R; Madrs, G, Polym. Deg. Stab., 93, 1440-49, 2008.
Temperature of polymerization	°C	60	
Catalyst	-	anatase titania	
Yield	%	67-77	Bai, F; Huang, B; Yang, X; Huang, W, Eur. Polym. J., 43, 3923-32, 2007.
Mass average molecular weight, M_w	dalton, g/mol, amu	25,000-350,000	
Polydispersity, M_w/M_n	-	1.03-2.9	
Radius of gyration	nm	3.6-4	Muroga, Y; Yoshida, T; Kawaguchi, S, Biophys. Chem., 81, 45-57, 1999.
Mean-square radius of chain's cross-section,	nm	0.3-0.42	Muroga, Y; Yoshida, T; Kawaguchi, S, Biophys. Chem., 81, 45-57, 1999.
STRUCTURE			
Stereoregularity	%	iso – 13, hetero – 52, syndio – 35	Muroga, Y; Yoshida, T; Kawaguchi, S, Biophys. Chem., 81, 45-57, 1999.
PHYSICAL PROPERTIES			
Density at 20°C	g cm^{-3}	1.285	
Melting temperature, DSC	°C	205	
Decomposition temperature	°C	220	

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Glass transition temperature	°C	228-230	
Speed of sound	m s^{-1}	3,350	
MECHANICAL & RHEOLOGICAL PROPERTIES			
Tensile strength	MPa	2.53	
Intrinsic viscosity, 25°C	dl g^{-1}	1.0	
CHEMICAL RESISTANCE			
Acid dilute/concentrated	-	non resistant	
Alcohols	-	non resistant	
Alkalis	-	non resistant	
Aliphatic hydrocarbons	-	resistant	
Aromatic hydrocarbons	-	resistant	
Esters	-	resistant	
Greases & oils	-	resistant	
Ketones	-	resistant	
Θ solvent, Θ-temp.=27.1°C	-	DMF/dioxane=5/7	Sivadasa, K; Gundiah, S, Polymer, 28, 8, 1426-28, 1987.
Good solvent	-	alcohols, dioxane, DMF, ethanol, methanol, water,	
Non-solvent	-	acetone, aliphatic hydrocarbons, benzene, diethyl ether, esters, ketones	
FLAMMABILITY			
Autoignition temperature	°C	500	
Char at 500°C	%	0.5	
WEATHER STABILITY			
Excitation wavelengths	nm	290	Ruiz-Perez, L; Pryke, A; Sommer, M; Battaglia, G; Soutar, I; Swanson, L; Geoghegan, M, Macromolecules, 41, 2203-11, 2008.
Transmittance	%	100 nm – 58.4; 300 nm – 19.9	Matsuzawa, N N; Oizumi, H; Mori, S; Irie, S; Shirayone, S; Yano, E; Okazaki, S; Ishitani, S; Dixon, D A, Jpn. J. Appl. Phys., 38, 7109-13, 1999.
TOXICITY			
NFPA: Health, Flammability, Reactivity rating	-	1/1/0; 0/1/0 (HMIS)	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
PROCESSING			
Applications	-	cosmetics (thickening and viscosity enhancement), flocculants, superabsorbant	
BLENDS			
Suitable polymers	-	chitosan, PS, starch	

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ANALYSIS			
FTIR (wavenumber-assignment)	cm^{-1}/-	C=O – 1736, 1719, 1695, 1679; C-C-O – 1262, 1242, C-O – 1185, 1154	Tajiri, T; Morita, S; Ozaki, Y, Polymer, 50, 5765-70, 2009.