EMA poly(ethylene-co-methyl acrylate)

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	poly(ethylene-co-methyl acrylate)	
CAS name	-	2-propenoic acid, methyl ester, polymer with ethene	
Acronym	-	EMA	
CAS number	-	25103-74-6	
SYNTHESIS			
Monomer(s) structure	-	CH_2=CH_2; CH_2=$CHCOOCH_3$	
Monomer(s) CAS number(s)	-	74-85-1; 96-33-3	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	28.05; 86.04	
Methyl acrylate content	wt%	6.8-55	
Method of synthesis	-	in the presence of a mixture of initiators (e.g., peroxides and azo compounds), ethylene and methyl acrylate can be copolymerized via a free-radical mechanism	Kiparissides, C; Baltsas, A; Papadopoulos, S; Congalidis, J P; Richards, J R; Kelly, M B; Ye, Y, Ind. Eng. Chem. Res., 44, 2592-2605, 2005.
Mass average molecular weight, M_w	dalton, g/mol, amu	100,000-390,000	Albrecht, A; Bruell, R; Macko, T; Sinha, P; Pasch, H, Macromol. Chem. Phys., 209, 1909-19, 2008.
Polydispersity, M_w/M_n	-	3.7-8.7	
STRUCTURE			
Chain conformation	-	planar zig-zag	
Surface organization		at low concentrations of MA (<20 wt%) surface is dominated by MA-depleted layer; at high MA concentrations surface contains EMA backbone	Galuska, A; Surf. Interface Anal., 24, 380-8, 1996.
COMMERCIAL POLYMERS			
Some manufacturers	-	Arkema; DuPont; ExxonMobil; Westlake Polymers	
Trade names	-	Lotader, Lotryl; Elvaloy AC, Vamac; Optema; Emac	
PHYSICAL PROPERTIES			
Density at 20°C	g cm^{-3}	0.93-0.95	
Color	-	translucent to whitish	
Odor	-	ester-like	
Melting temperature, DSC	°C	33-101	
Degradation temperature	°C	>350; 330; >282	Mongal, N; Chakraborty, D; Bhattacharyya, R; Chaki, T K; Bhattacharta, P, J. Appl. Polym. Sci., 117, 75-83, 2010.
Glass transition temperature	°C	-29.8 to - 35.6	Kanis, L A; Generoso, M; Meier, M M; Pires, A T N; Soldi, V, Eur. J. Phamaceutics Biopharmaceutics, 60, 383-90, 2005.
Heat of fusion	J g^{-1}	19-45	
Vicat temperature VST/A/50	°C	43-70	
Dielectric constant at 100 Hz/1 MHz	-	4	
Volume resistivity	ohm-m	1-2.5E11	

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PARAMETER	UNIT	VALUE	REFERENCES
Contact angle of water, 20°C	degree	64-85	Kanis, L A; Generoso, M; Meier, M M; Pires, A T N; Soldi, V, Eur. J. Phamaceutics Biopharmaceutics, 60, 383-90, 2005.
MECHANICAL & RHEOLOGICAL PROPERTIES			
Tensile strength	MPa	5-11; 19.7-24.2 (MD); 19.8-25.3 (TD)	
Elongation	%	380-850; 370-380 (MD); 610-670 (TD)	
Flexural modulus	MPa	37	
Elastic modulus	MPa	6.5-81	
Dart drop impact	g	370-520	
Elmendorf tear strength	g	30-45 (MD); 200-320 (TD)	
Shore A hardness	-	76-86	
Shore D hardness	-	24-34	
Melt index, 190°C/2.16 kg	g/10 min	0.5-110	
CHEMICAL RESISTANCE			
Alcohols	-	poor	
FLAMMABILITY			
Autoignition temperature	°C	>450	
Volatile products of combustion	-	CO_2, CO, alcohols, ketones, aldehydes, esters, acids, acrolein	
TOXICITY			
HMIS: Health, Flammability, Reactivity rating	-	1/1/0	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
TLV, ACGIH	mg m^{-3}	10 (inhalable), 3 (respirable)	
OSHA	mg m^{-3}	15 (total dust); 5 (respirable)	
PROCESSING			
Typical processing methods	-	coextrusion coating, extrusion (blown film, cast film, coextrusion); extrusion lamination	
Processing temperature	°C	165-310; 310 (max)	
Additives used in final products	-	Antiblock; Slip; Thermal stabilizer, MWCNT	Basuli, U; Panja, S; Chaki, T K; Chattopadhyay, Handbook of Polymer Nanocomposites. Volume B, Springer, 2015, 245-280.
Applications	-	disposable gloves, drug delivery membrane, food packaging, heat seals, hospital drapes, performance booster for other resins, packaging, upholstery film	
Outstanding properties	-	easy processing, compatible with LDPE, printability, sealing	
BLENDS			
Suitable polymers	-	CR, PMA; PP	
ANALYSIS			
FTIR (wavenumber-assignment)	cm^{-1}/-	C=O – 1740; CH_3 – 1376	Albrecht, A; Bruell, R; Macko, T; Sinha, P; Pasch, H, Macromol. Chem. Phys., 209, 1909-19, 2008.