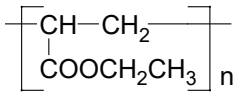
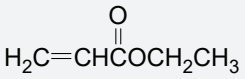
PEA poly(ethyl acrylate)

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	poly(ethyl acrylate)	
CAS name	-	2-propenoic acid, ethyl ester, homopolymer	
Acronym	-	PEA	
CAS number	-	9003-32-1	
Linear formula			
SYNTHESIS			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	140-88-5	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	100.11	
Monomer(s) expected purity(ies)	%	99	
Method of synthesis	-	radical polymerization in the presence of 0.1 wt% benzoin as a photoinitiator	Mas Estelles, J; Krakovsky, I; Rodriguez Hernandz, J C; Piotrowska, A M; Monleon Pradas, M, J. Mater. Sci., 42, 8629-35, 2007; Rico, P; Gonzalez-Garcia, C; Petrie, T A; Garcia, A J, Colloids Surfaces: Biointerfaces, 78, 310-16, 2010.
Number average molecular weight, M_n	dalton, g/mol, amu	7,700	
Mass average molecular weight, M_w	dalton, g/mol, amu	14,000-1,600,000	
Polydispersity, M_w/M_n	-	1.06-3.44	
Molar volume at 298K	$cm^3 mol^{-1}$	calc.=86.6-87.6; 89.4 (amorphous); exp.=89.4	
Van der Waals volume	$cm^3 mol^{-1}$	calc.=56.1 (amorphous); exp.=56.89	
End-to-end distance of unperturbed polymer chain	nm	95.7-177.8	Srinivasan, K S V; Santapa, M, Polymer, 14, 1, 5-8, 1973.
Degree of branching	%	1.31	Castignolles, P; Graf, R; Parkinson, M; Wilhelm, M; Gaborieau, M, Polymer, 50, 2373-83, 2009.
STRUCTURE			
Cis content	%	33	McNeill, I C; Mohammed, M H, Polym. Deg. Stab., 48, 175-87, 1995.
Entanglement molecular weight	dalton, g/mol, amu	calc.=9,093	
PHYSICAL PROPERTIES			
Density at 20°C	$g\ cm^{-3}$	1.08; 1.12 (amorphous)	
Refractive index, 20°C	-	calc.=1.468-1.477; exp.=1.469-1.54	
Decomposition temperature	°C	234	Castignolles, P; Graf, R; Parkinson, M; Wilhelm, M; Gaborieau, M, Polymer, 50, 2373-83, 2009.

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Thermal conductivity, melt	W m^{-1} K^{-1}	0.1658	
Glass transition temperature	°C	-24 to -21; calc.=-6 to -22; exp.=-21 to -27; -24 (syndiotactic) -25 (isotactic); -17 (grafted)	Zampano, G; Bertoldo, M; Bronco, S, Carbohydrate, 75, 22-31, 2009.
Hildebrand solubility parameter	$MPa^{0.5}$	calc.=18.27; exp.=19.3	
Surface tension	mN m^{-1}	37.0	
Contact angle of water, 20°C	degree	89	Rico, P; Gonzalez-Garcia, C; Petrie, T A; Garcia, A J, Colloids Surfaces: Biointerfaces, 78, 310-16, 2010.
Surface free energy	mJ m^{-2}	35.1	
MECHANICAL & RHEOLOGICAL PROPERTIES			
Poisson's ratio	-	calc.=0.373	
Water absorption, equilibrium in water at 23°C	%	1.7	
CHEMICAL RESISTANCE			
Alcohols	-	poor	
Aliphatic hydrocarbons	-	poor	
Aromatic hydrocarbons	-	poor	
Esters	-	poor	
Halogenated hydrocarbons	-	poor	
Ketones	-	poor	
Θ solvent, Θ-temp.=44.9, 37.4, 20.5°C	-	n-butanol, ethanol, metanol	Llopis, J; Albert, A; Usobiaga, Eur. Polym. J., 3, 259-65, 1967.
Good solvent	-	acetone, aromatic hydrocarbons, butanol, chlorinated hydrocarbons, ester, glycol ether, ketones, methanol, THF, p-xylene	
Non-solvent	-	aliphatic hydrocarbons, cyclohexanol, diethyl ether, higher aliphatic alcohols, tetrahydrofurfuryl alcohol	
FLAMMABILITY			
Volatile products of combustion	-	CO_2, ethylene, ethanol, ethyl acrylate	McNeill, I C; Mohammed, M H, Polym. Deg. Stab., 48, 175-87, 1995.
TOXICITY			
NFPA: Health, Flammability, Reactivity rating	-	1/3/0	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
Mutagenic effect	-	none	
TLV, ACGIH	ppm	188	
Oral rat, LD_{50}	mg kg^{-1}	636	
Skin rabbit, LD_{50}	mg kg^{-1}	12,124	
PROCESSING			
Additives used in final products	-	Plasticizers: dipropylene glycol dibenzoate, isodecyl diphenyl phosphate, dibutyl phthalate, 2,2,4-trimethyl-1,3-pentanediol monoisobutyrate and dibutyl, dihexyl, and dioctyl phthalates	
Outstanding properties	-	latex paints, tablet coating	

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PARAMETER	UNIT	VALUE	REFERENCES
BLENDS			
Suitable polymers	-	EEA, epoxy, LDPE, PBA, PFS, PPA, PVC, PVDF-HFA, PVF	
ANALYSIS			
NMR (chemical shifts)	ppm	CH_3 – 1.2; CH_2 – 4.05, 1.84, 1.58; CH – 2.24;	McNeill, I C; Mohammed, M H, Polym. Deg. Stab., 48, 175-87, 1995.