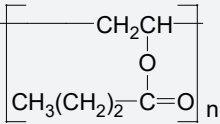
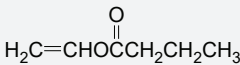


PVB poly(vinyl butyrate)

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	poly(vinyl butyrate)	
CAS name	-	ethenol, homopolymer, cyclic acetal with butanal	
Acronym	-	PVB	
CAS number	-	63148-65-2; 24991-31-9	
RTECS number	-	TR4955000	
Formula			
HISTORY			
Person to discover	-	Overholt, R L	Overholt, R L, US Patent 2,293,558, DuPont, Aug. 18, 1942.
Date	-	1942	
Details	-	use of PVB in coating composition	
SYNTHESIS			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	123-20-6	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	114.14	
Method of synthesis	-	PVB is prepared by reacting poly(vinyl alcohol) with butyraldehyde in the presence of an acid catalyst	Fernandez, M D; Fernandez, M J, Hoces, P, J. Appl. Polym. Sci., 102, 5007-17, 2006.
Temperature of polymerization	°C	30	
Time of polymerization	h	72	
Pressure of polymerization	Pa	atmospheric	
Catalyst	-	HCl	
Mass average molecular weight, M_w	dalton, g/mol, amu	40,000-120,000	
Chain-end groups	-	OH	
PHYSICAL PROPERTIES			
Density at 20°C	g cm ⁻³	1.07-1.1	
Color	-	white	
Refractive index, 20°C	-	1.47-1.50	
Odor		slightly pungent	
Melting temperature, DSC	°C	90-120	
Thermal conductivity, melt	W m ⁻¹ K ⁻¹	0.236	
Glass transition temperature	°C	57-71	
Hansen solubility parameters, δ_D , δ_P , δ_H	MPa ^{0.5}	18.6, 4.36, 13.03; 19.1, 9.5, 12.2	
Interaction radius		10.0	
Molar volume	kmol m ⁻³		
Hildebrand solubility parameter	MPa ^{0.5}	23.12; 24.6	

PVB poly(vinyl butyrate)

PARAMETER	UNIT	VALUE	REFERENCES
Surface tension	mN m ⁻¹	calc.=38.0; exp.=28.9; 32 (245°C); 26.4 (255°C)	Morais, D; Valera, T S; Demarquette, N R, Macromol. Symp., 245-246, 208-14, 2006.
Dielectric constant at 100 Hz/1 MHz	-	2.6-3.2	
Dissipation factor at 100 Hz	E-4	0.0064-0.03	
Permeability to water vapor, 25°C	cm ³ cm cm ⁻² s ⁻¹ Pa ⁻¹ x 10 ¹²	60.8	
Surface free energy	mJ m ⁻²	38.0	
Speed of sound	m s ⁻¹	39.2	
Acoustic impedance		2.60	
MECHANICAL & RHEOLOGICAL PROPERTIES			
Tensile strength	MPa	22.2-23.0	Valera, T S; Demarquette, N R, Eur. Polym. J., 44, 755-68, 2008.
Tensile modulus	MPa	6.4	
Elongation	%	190-380	
Flexural modulus	MPa	14	
Young's modulus	MPa	100	Xu, J; Sun, Y; Liu, B; Zhu, M; Yao, X; Yan, Y; Li, Y; Chen, X, Eng. Failure Anal., in press, 2011.
Poisson's ratio	-	0.48-0.49	Xu, J; Sun, Y; Liu, B; Zhu, M; Yao, X; Yan, Y; Li, Y; Chen, X, Eng. Failure Anal., in press, 2011.
Shore A hardness	-	63-82	
Shore D hardness	-	27	
Melt index, 190°C/2.16 kg	g/10 min	2.4-3	
CHEMICAL RESISTANCE			
Alcohols	-	poor	
Aliphatic hydrocarbons	-	good	
Aromatic hydrocarbons	-	good	
Esters	-	good	
Halogenated hydrocarbons	-	poor	
Ketones	-	good	
Good solvent	-	alcohols, cyclohexanone, lower esters, methylene chloride	
Non-solvent	-	aliphatic ketones, hydrocarbons, MIBK	
FLAMMABILITY			
Autoignition temperature	°C	390	
Char at 500°C	%	0.1	Lyon, R E; Walters, R N, J. Anal. Appl. Pyrolysis, 71, 27-46, 2004.
TOXICITY			
NFPA: Health, Flammability, Reactivity rating	-	1/1/0	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
Oral rat, LD ₅₀	mg kg ⁻¹	10,000	
Skin rabbit, LD ₅₀	mg kg ⁻¹	7,940	

PVB poly(vinyl butyrate)

PARAMETER	UNIT	VALUE	REFERENCES
PROCESSING			
Typical processing methods	-	compounding, electrospinning, extrusion, powder coating	
Processing temperature	°C	120 (bonding to glass)	
Processing pressure	bar	10 (bonding to glass)	
Additives used in final products	-	Fillers: aluminum hydroxide, calcium carbonate, carbon black, graphite, rust protection fillers, zinc oxide; Plasticizers: biphenyl, dibutyl sebacate, diglycidyl ether of bisphenol A, dihexyl adipate, hexyl cyclohexyl adipate, polyethylene glycol, tetraethylene glycol di-n-heptanoate, triethylene glycol di-(2-ethylhexanoate); Antistatics: antimony-doped tin oxide, vanadium pentoxide; Antiblocking: silica; Release: liquid paraffin, n-butyl stearate, silicone	
Applications	-	adhesives and sealants, binders for rocket propellant, bullet-proof glass, ceramic binders, collapsible tubes, composite fiber binders, control of light, drum interiors, dry toners, heat and sound in construction glass, inks, magnetic tapes, nanofibers, paints, photoconductive papers, powder coating, safety glass interlayer (automotive windshields), wash primers, wood sealers and primers	
BLENDS			
Suitable polymers	-	chitosan; PA6 (PVB is impact modifier), PP or PVC (tackifier)	
Compatibilizers	-	anhydride functionalized modifier	Hofmann, G H, Antec, 3241-45, 1999.
ANALYSIS			
FTIR (wavenumber-assignment)	cm ⁻¹ /-	OH – 3489; C-H – 2970; C=O – 1730	Valera, T S; Demarquette, N R, Eur. Polym. J., 44, 755-68, 2008.
NMR (chemical shifts)	ppm	CH ₃ – 13.7; CH ₂ – 17.3, 36.7, 37.1, 41.5, 42.5; CH – 64.8, more	Fernandez, M D; Fernandez, M J, Hoces, P, J. Appl. Polym. Sci., 102, 5007-17, 2006.