

# PVME poly(vinyl methyl ether)

PARAMETER	UNIT	VALUE	REFERENCES
<b>GENERAL</b>			
Common name	-	poly(vinyl methyl ether)	
CAS name	-	ethene, methoxy-, homopolymer	
Acronym	-	PVME	
CAS number	-	9003-09-2	
Formula		$\left[ \text{CH}_2\text{CH} \begin{array}{c}   \\ \text{OCH}_3 \end{array} \right]_n$	
<b>HISTORY</b>			
Person to discover	-	Reppe, W; Schlichting, O	Reppe, W; Schlichting, O, US Patent 2,104,000, IG Farben, Dec. 28, 1937.
Date	-	1937	
Details	-	production of polymerization products from vinyl ethers	
<b>SYNTHESIS</b>			
Monomer(s) structure	-	$\text{H}_2\text{C}=\text{CHOCH}_3$	
Monomer(s) CAS number(s)	-	107-25-5	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	70.09	
Number average molecular weight, $M_n$	dalton, g/mol, amu	10,000-18,100	
Mass average molecular weight, $M_w$	dalton, g/mol, amu	50,500-354,000	
Polydispersity, $M_w/M_n$	-	1.05-2.5	Morariu, S; Eckelt, J; Wolf, B A, Ind. Eng. Chem. Res., 48, 6943-48, 2009.
Molar volume at 298K	cm <sup>3</sup> mol <sup>-1</sup>	calc.=50.0 (crystalline)	
Van der Waals volume	cm <sup>3</sup> mol <sup>-1</sup>	calc.=34.4; 35.7 (crystalline)	
<b>STRUCTURE</b>			
Cell type (lattice)	-	trigonal	
Cell dimensions	nm	a:b:c=1.62:1.62:6.5	Bassi, I W; Atti. Accad. Nazl. Lincei, Cl. Sci. Fis., Mat. Nat., Rend., 29, 193, 1960.
Unit cell angles	degree	$\alpha:\beta:\gamma=90:90:120$	
Number of chains per unit cell	-	18	
Tacticity	%	59 (isotactic)	Hanykova, L; Labuta, J; Spevacek, J, Polymer, 47, 6107-16, 2006.
Chain conformation	-	helix 3/1	
Avrami constants, k/n	-	n=1.0-1.24; k=0.83-7.72x104	Zhang, T; Li, T; Nies, E; Beghmans, H; Ge, L, Polymer, 50, 1206-13, 2009.
<b>COMMERCIAL POLYMERS</b>			
Some manufacturers	-	BASF	
Trade names	-	Lutonal	

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<b>PHYSICAL PROPERTIES</b>			
Density at 20°C	g cm <sup>-3</sup>	1.03-1.05	
Bulk density at 20°C	g cm <sup>-3</sup>	0.94-1.03	
Color	-	clear	
Refractive index, 20°C	-	1.467-1.478	
Melting temperature, DSC	°C	144	
Thermal expansion coefficient, 23-80°C	°C <sup>-1</sup>	6.8E-4	
Glass transition temperature	°C	calc.= -21; exp.= -20 to -34	
Hildebrand solubility parameter	MPa <sup>0.5</sup>	calc.=19.44	
Surface tension	mN m <sup>-1</sup>	31.8	
<b>MECHANICAL &amp; RHEOLOGICAL PROPERTIES</b>			
Tensile strength	MPa	11.65-14.00	
<b>CHEMICAL RESISTANCE</b>			
Acid dilute/concentrated	-	good/poor	
Alcohols	-	poor	
Alkalis	-	good	
Aromatic hydrocarbons	-	poor	
Esters	-	poor	
Ketones	-	poor	
⊖ solvent, ⊖-temp.=51°C	-	cyclohexane	
Good solvent	-	acetone, ethanol, ethyl acetate, methylene chloride, THF	
Non-solvent	-	diethyl ether, ethylene glycol, hexane	
<b>FLAMMABILITY</b>			
Ignition temperature	°C	230	
Autoignition temperature	°C	390	
Volatile products of combustion	-	CO, CO <sub>2</sub> , hydrocarbons	
<b>WEATHER STABILITY</b>			
Products of degradation	-	tertiary peroxide, ketone groups, methanol, CO, CO <sub>2</sub> , acetic acid, methyl acetate, formic acid, dimethyl malonate	
<b>TOXICITY</b>			
HMIS: Health, Flammability, Reactivity rating	-	1/1/0	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
Oral rat, LD <sub>50</sub>	mg kg <sup>-1</sup>	>5,000	
<b>ENVIRONMENTAL IMPACT</b>			
Aquatic toxicity, <i>Bluegill sunfish</i> , LC <sub>50</sub> , 48 h	mg l <sup>-1</sup>	>500	
<b>PROCESSING</b>			
Applications	-	marine antifouling paints	

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PARAMETER	UNIT	VALUE	REFERENCES
<b>Outstanding properties</b>	-	improves adhesion of liquid coatings, saponification resistant	
<b>BLENDS</b>			
<b>Suitable polymers</b>	-	PAA, PANI, PCL, iPS, sPS, PS, SAN	
<b>ANALYSIS</b>			
<b>FTIR (wavenumber-assignment)</b>	cm <sup>-1</sup> /-	C-H – 2991, 2949, 2839, 1468, 1388; C-C – 1193; C-O – 1135, 1105, 1070	Maeda, Y, Langmuir, 17, 1737-42, 2001; Guo, Y; Peng, Y; Wu, P, J. Mol. Structure, 875, 486-92, 2008.