


# PTMG poly(tetramethylene glycol)

PARAMETER	UNIT	VALUE	REFERENCES
<b>GENERAL</b>			
Common name	-	poly(tetramethylene glycol)	
CAS name	-	poly(oxy-1,4-butanediyl), alpha-hydro-gamma-hydroxy-; glycols, polytetramethylene	
Acronym	-	PTMG	
CAS number	-	25190-06-1	
RTECS number	-	MD0916000	
Formula		$\left[ \text{OCH}_2\text{CH}_2\text{CH}_2\text{CH}_2 \right]_n$	
<b>SYNTHESIS</b>			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	109-99-9	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	72.11	
Monomer ratio	-	100%	
Formulation example	-	reaction mixture comprising tetrahydrofuran, catalyst, accelerator, and ionic liquid	Harmer, M A; Junk, C P; Manzer, L E, US Patent 7,402,711, DuPont, 2008.
Temperature of polymerization	°C	0-70	
Catalyst	-	acid	
Number average molecular weight, $M_n$	dalton, g/mol, amu	248-4,462	
Mass average molecular weight, $M_w$	dalton, g/mol, amu	400-20,000	
Polydispersity, $M_w/M_n$	-	1.8-4	
Polymerization degree (number of monomer units)	-	3-62	
Molar volume at 298K	cm <sup>3</sup> mol <sup>-1</sup>	calc.=61.0 (crystalline); 73.5 (amorphous)	
Van der Waals volume	cm <sup>3</sup> mol <sup>-1</sup>	calc.=44.6 (crystalline); 44.6 (amorphous)	
<b>COMMERCIAL POLYMERS</b>			
Some manufacturers	-	LyondellBasell; Invista	
Trade names	-	Polymeg, Terathane	
<b>PHYSICAL PROPERTIES</b>			
Density at 20°C	g cm <sup>-3</sup>	0.972-0.987	
Bulk density at 20°C	g cm <sup>-3</sup>	0.973-0.982	
Color	-	colorless	
Odor		odorless	
Melting temperature, DSC	°C	19-55	
Decomposition temperature	°C	210-240	
Storage temperature	°C	20 to <95; stable for 1 year at 65°C under nitrogen	
Glass transition temperature	°C	-74 to -85	

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PARAMETER	UNIT	VALUE	REFERENCES
Surface free energy	mJ m <sup>-2</sup>	31.9	
<b>MECHANICAL &amp; RHEOLOGICAL PROPERTIES</b>			
Melt viscosity, shear rate=1000 s <sup>-1</sup>	Pa s	0.4-1.27	
Water absorption, equilibrium in water at 23°C	%	2	
<b>CHEMICAL RESISTANCE</b>			
Alcohols	-	soluble	
Aliphatic hydrocarbons	-	insoluble	
Aromatic hydrocarbons	-	soluble	
Esters	-	soluble	
Halogenated hydrocarbons	-	soluble	
Ketones	-	soluble	
<b>FLAMMABILITY</b>			
Ignition temperature	°C	193-246	
Autoignition temperature	°C	>245	
Activation energy of thermal degradation	kJ mol <sup>-1</sup>	60-70	Tago, K; Tsuchiya, M; Gondo, Y; Ishimaru, K; Kojima, T, J. Appl. Polym. Sci., 77, 1538-44, 2000.
Volatile products of combustion	-	CO, CO <sub>2</sub> , tetrahydrofuran	
<b>BIODEGRADATION</b>			
Typical biodegradants	-	fungus resistance	
<b>TOXICITY</b>			
NFPA: 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 to 18,830	
Skin rabbit, LD <sub>50</sub>	mg kg <sup>-1</sup>	8,375-10,250	
<b>ENVIRONMENTAL IMPACT</b>			
Aquatic toxicity, <i>Fathead minnow</i> , LC <sub>50</sub> , 48 h	mg l <sup>-1</sup>	>1,000 to >2,000	
Biological oxygen demand, BOD <sub>32</sub>	% ThOD	10-50	
<b>PROCESSING</b>			
Applications	-	coatings, polyurethanes, spandex	
Outstanding properties	-	products using PTMG have: low temperature flexibility, tear strength, abrasion resistance, and good hydrolytic stability	
<b>BLENDS</b>			
Suitable polymers	-	PVC	