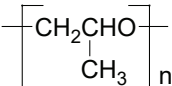



PPG polypropylene glycol

PARAMETER	UNIT	VALUE	REFERENCES
GENERAL			
Common name	-	polypropylene glycol, polypropylene oxide	
ACS name	-	poly[oxy(methyl-1,2-ethanediyl)], α -hydro- ω -hydroxy-	
Acronym	-	PPG	
CAS number	-	25322-69-4	
EC number	-	233-239-6; 500-039-8	
RTECS number	-	TR5250000 TR5300000 TR5425000 TR5600000 TR5775000 TR5785000 TR5800000 TR5950000 TR6125000 TR6129000 TR6130000 TR6200000 TR6210000 TR6215000 TR6220000	
Formula			
HISTORY			
Person to discover	-	Morris, R C; Snider, A V	Morris, R C; Snider, A V, US Patent 2,520,733, Shell, Aug. 29, 1950.
Date	-	1950	
Details	-	polymers of trimethylene glycol	
SYNTHESIS			
Monomer(s) structure	-		
Monomer(s) CAS number(s)	-	75-56-9	
Monomer(s) molecular weight(s)	dalton, g/mol, amu	58.08	
Monomer ratio	-	100%	
Mass average molecular weight, M_w	dalton, g/mol, amu	76-18,200	Gainaru, C; Hiller, W; Boehmer, R, Macromolecules, 43. 1907-14, 2010.
Polydispersity, M_w/M_n	-	1.0-1.07	
Polymerization degree (number of monomer units)	-	3-180	
Molar volume at 298K	cm ³ mol ⁻¹	calc.=50.5 (crystalline); 58.1 (amorphous)	
Van der Waals volume	cm ³ mol ⁻¹	calc.-34.4 (crystalline); 34.4 (amorphous)	
Free volume fraction at T_g		0.010-0.029	Consolati, G; Levi, M; Messa, L; Tieghi, G, Europhys. Lett., 53, 4, 497-503, 2001.
Free volume at T_g	cm ³ g ⁻¹	0.895-0.898	Consolati, G; Levi, M; Messa, L; Tieghi, G, Europhys. Lett., 53, 4, 497-503, 2001.
Chain-end groups	-	OH	
STRUCTURE			
Cell type (lattice)	-	orthorhombic	
Cell dimensions	nm	a:b:c=1.046-1.052:0.464-0.469:0.692-0.716	
Unit cell angles	degree	α : β : γ =90:90:90	
Number of chains per unit cell	-	4	
Chain conformation	-	planar zigzag	

PPG polypropylene glycol

PARAMETER	UNIT	VALUE	REFERENCES
COMMERCIAL POLYMERS			
Some manufacturers	-	DOW	
Trade names	-	PPGs	
PHYSICAL PROPERTIES			
Density at 20°C	g cm ⁻³	1.002-1.09; 1.126 (crystalline)	
Color	-	clear	
Refractive index, 20°C	-	1.447-1.459	
Odor		sweet	
Melting temperature, DSC	°C	-40 to 73	
Pour point	°C	-18 to -45	
Boiling temperature	°C	188 to >300	
Storage temperature	°C	24	
Thermal expansion coefficient, 23-80°C	10 ⁻⁴ °C ⁻¹	7.2-8.3 (liquid); 2.35-4.2 (glassy)	Consolati, G; Levi, M; Messa, L; Tieghi, G, Europhys. Lett., 53, 4, 497-503, 2001.
Glass transition temperature	°C	-77 to -74	Consolati, G; Levi, M; Messa, L; Tieghi, G, Europhys. Lett., 53, 4, 497-503, 2001.
Hildebrand solubility parameter	MPa ^{0.5}	exp.=16.1-16.3	
Surface tension	mN m ⁻¹	31.2-51.3	
Surface free energy	mJ m ⁻²	30.6	
CHEMICAL RESISTANCE			
Alcohols	-	soluble	
Aliphatic hydrocarbons	-	miscible	
Aromatic hydrocarbons	-	soluble	
Esters	-	miscible	
Greases & oils	-	insoluble	
Halogenated hydrocarbons	-	soluble	
Ketones	-	soluble	
⊖ solvent, ⊖-temp.=50.5°C	-	isooctane	
Good solvent	-	acetone, benzene, chloroform, dioxane, ethanol, methanol (hot), THF	
Non-solvent	-	diethyl ether, N,N-dimethylacetamide	
FLAMMABILITY			
Ignition temperature	°C	185-246	
Autoignition temperature	°C	>350	
Heat of combustion	J g ⁻¹	10,510-11,410	
Volatile products of combustion	-	CO, CO ₂	
WEATHER STABILITY			
Important initiators and accelerators	-	Fe acetylacetonate	Semsarzadeh, M; Salehi, H, Eur. Polym. J., 36, 5, 1001-10, 2000.

PPG polypropylene glycol

PARAMETER	UNIT	VALUE	REFERENCES
BIODEGRADATION			
Typical biodegradants	-	<i>Sphingopyxis terrae</i> , <i>S. macrogoltabida</i> , <i>Sphingomonas sp.</i> , <i>Sphingobium</i> species, <i>Pseudomonas</i> species, and <i>S. maltophilia</i>	Hu, X; Fukutani, A; Liu, X; Kimbara, K; Kawai, F, Appl. Microbiol. Biotechnol., 73, 1407-13, 2007.
TOXICITY			
NFPA: Health, Flammability, Reactivity rating	-	1/1/0	
Carcinogenic effect	-	not listed by ACGIH, NIOSH, NTP	
Oral rat, LD ₅₀	mg kg ⁻¹	2,150-21,000	
Skin rabbit, LD ₅₀	mg kg ⁻¹	>10,000 to >30,000	
ENVIRONMENTAL IMPACT			
Aquatic toxicity, <i>Bluegill sunfish</i> , LC ₅₀ * 48 h	mg l ⁻¹	1,700	
Aquatic toxicity, <i>Rainbow trout</i> , LC ₅₀ * 48 h	mg l ⁻¹	10,000	
PROCESSING			
Applications	-	fiber and textile processing, food, metalworking, paper processing, personal care, plastics, polyurethane synthesis, water and waste water treatment	
ANALYSIS			
FTIR (wavenumber-assignment)	cm ⁻¹ /-	C=O – 1728; CH ₂ – 2975	Semsarzadeh, M; Salehi, H, Eur. Polym. J., 36, 5, 1001-10, 2000.