

## Surface Energy Data for PMMA: Poly(methylmethacrylate), CAS # 9011-14-7

Source <sup>(a)</sup>	Mst. Type <sup>(b)</sup>	Data <sup>(c)</sup>	Comments <sup>(d)</sup>
Jarvis, 1964 <sup>(15)</sup>	Critical ST	$\gamma_c = 39 \text{ mJ/m}^2$ ; 25°C	Various test liquids.
Lee, 1968 <sup>(131)</sup>	Critical ST	$\gamma_c = 38 \text{ mJ/m}^2$ ; no temp cited	Test liquids: water, glycerol, formamide, alcohols, and long-chain polyglycols.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 30.5 \text{ mJ/m}^2$ ; 25°C	Ethylene glycol/2-ethoxyethanol mixes, based on advancing contact angles.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 39 \text{ mJ/m}^2$ ; 25°C	Ethylene glycol/2-ethoxyethanol mixes, based on retreating contact angles.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 31.5 \text{ mJ/m}^2$ ; 25°C	Polyglycol blends, based on advancing contact angles.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 37 \text{ mJ/m}^2$ ; 25°C	Polyglycol blends, based on retreating contact angles.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 30 \text{ mJ/m}^2$ ; 25°C	Formamide/2-ethoxyethanol mixes, based on advancing contact angles.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 41 \text{ mJ/m}^2$ ; 25°C	Formamide/2-ethoxyethanol mixes, based on retreating contact angles.
Dann, 1970 <sup>(94)</sup>	Critical ST	$\gamma_c = 45 \text{ mJ/m}^2$ ; 25°C	Per ASTM D-2578, using formamide/2-ethoxyethanol mixes.
Jarvis, 1964 <sup>(15)</sup>	Contact angle	$\theta_W^A = 94^\circ$ ; 25°C, 15-30% RH	Polymer surface prepared by solvent evaporation.
Jarvis, 1964 <sup>(15)</sup>	Contact angle	$\theta_W^A = 80^\circ$ ; 25°C, 15-30% RH	Smooth surface prepared by pressing polymer powder against stainless steel at 150°C.
Dann, 1970 <sup>(94)</sup>	Contact angle	$\theta_W^A = 74^\circ$ ; 25°C	Sessile drop method; surface cleaned with detergent and rinsed with distilled water.
Wu, 1971 <sup>(29)</sup>	Contact angle	$\theta_W^Y = 80^\circ$ ; 20°C	
Panzer, 1973 <sup>(250)</sup>	Contact angle	$\theta_W^A = 71^\circ$ ; no temp cited	
Omenyi, 1980 <sup>(266)</sup>	Contact angle	$\theta_W^Y = 73^\circ$ ; no temp cited	
Winters, 1985 <sup>(184)</sup>	Contact angle	$\theta_W^Y = 73^\circ$ ; no temp cited	
Janczuk, 1989 <sup>(106)</sup>	Contact angle	$\theta_W^Y = 73.8^\circ$ ; 20°C	Unspecified cleaning method (per Good); ultrasonically rinsed with distilled water.
van Oss, 1990 <sup>(2)</sup>	Contact angle	$\theta_W^Y = 60^\circ$ ; 20°C	
van Oss, 1990 <sup>(2)</sup>	Contact angle	$\theta_W^Y = 72^\circ$ ; 20°C	
Jonsson, 1992 <sup>(112)</sup>	Contact angle	$\theta_W^Y = 62^\circ$ ; no temp cited	Cleaned by sonification in a 70/30 ethanol/water solution and rinsed with distilled water.
Van Oss, 1992 <sup>(236)</sup>	Contact angle	$\theta_W^A = 59.3^\circ$ ; no temp cited	
McNally, 1993 <sup>(5)</sup>	Contact angle	$\theta_W^A = 75^\circ$ , $\theta_W^R = 58^\circ$ , $d\theta_W = 17^\circ$ ; 25°C	
Fukuzawa, 1994 <sup>(113)</sup>	Contact angle	$\theta_W^Y = 71.3^\circ$ ; no temp cited	Contact angle measured after stabilizing for 15 secs.
Etzler, 2000 <sup>(250)</sup>	Contact angle	$\theta_W^A = 77.9^\circ$ ; 20°C	Measured by Wilhelmy plate method.
McCafferty, 2000 <sup>(217)</sup>	Contact angle	$\theta_W^Y = 64.3^\circ$ ; no temp cited	Surface cleaned with light methanol wipe.
Della Volpe, 2002 <sup>(141)</sup>	Contact angle	$\theta_W^A = 70.1^\circ$ , $\theta_W^R = 50.3^\circ$ , $d\theta_W = 19.8^\circ$ ; no temp cited	
Cho, 2005 <sup>(226)</sup>	Contact angle	$\theta_W^Y = 61^\circ$ ; no temp cited	Measured by sessile drop method.

Della Volpe, 2006 <sup>(137)</sup>	Contact angle	$\theta_W^Y = 69.9^\circ$ ; no temp cited	Wilhelmy plate method; surface cleaned in trichloroethylene; droplet size 3 $\mu$ l.
Della Volpe, 2006 <sup>(137)</sup>	Contact angle	$\theta_W^Y = 66.8^\circ$ ; no temp cited	Wilhelmy plate method; surface cleaned in trichloroethylene; droplet size 5 $\mu$ l.
Della Volpe, 2006 <sup>(137)</sup>	Contact angle	$\theta_W^Y = 64.4^\circ$ ; no temp cited	Vibrationally induced equilibrium method; surface cleaned in trichloroethylene; droplet size 3 $\mu$ l.
Della Volpe, 2006 <sup>(137)</sup>	Contact angle	$\theta_W^Y = 62.3^\circ$ ; no temp cited	Vibrationally induced equilibrium method; surface cleaned in trichloroethylene; droplet size 5 $\mu$ l.
Johansson, 2006 <sup>(113)</sup>	Contact angle	$\theta_W^A = 67^\circ$ ; no temp cited	Ultrasonically cleaned in isopropanol and rinsed with ethanol.
Dann, 1970 <sup>(94)</sup>	Contact angle	$\gamma_s^d = 41$ mJ/m <sup>2</sup> ; 25°C	Various test liquids.
Wu, 1971 <sup>(29)</sup>	Contact angle	$\gamma_s = 40.2$ mJ/m <sup>2</sup> ( $\gamma_s^d = 35.8$ ; $\gamma_s^p = 4.4$ ); 20°C	Test liquids: water and diiodomethane, by geometric mean equation.
Wu, 1971 <sup>(29)</sup>	Contact angle	$\gamma_s = 41.2$ mJ/m <sup>2</sup> ( $\gamma_s^d = 30.9$ ; $\gamma_s^p = 10.3$ ); 20°C	Test liquids: water and diiodomethane, by harmonic mean equation.
Kitazaki, 1972 <sup>(191)</sup>	Contact angle	$\gamma_s = 43.2$ mJ/m <sup>2</sup> ( $\gamma_s^d = 42.4$ , $\gamma_s^p = 0.8$ ); no temp cited	Various test liquids; original results split polar component into hydrogen- and non-hydrogen bonding parameters.
Wu, 1979 <sup>(45)</sup>	Contact angle	$\gamma_c = 42.5$ mJ/m <sup>2</sup> ; 20°C	Test liquids not known; calculated by the equation of state method.
Busscher, 1981 <sup>(72)</sup>	Contact angle	$\gamma_s = 44.3$ mJ/m <sup>2</sup> ( $\gamma_s^d = 33.7$ , $\gamma_s^p = 10.6$ ); no temp cited	Test liquids: water and propanol.
Chaudhury, 1984 <sup>(21)</sup>	Contact angle	$\gamma_s = 40.6$ mJ/m <sup>2</sup> ( $\gamma_s^{LW} = 40.6$ , $\gamma_s^{AB} = 0.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 12.0$ ); 20°C	Test liquids: water, alpha-bromonaphthalene, diiodomethane, formamide, and glycerin; acid-base analysis.
van Oss, 1987 <sup>(24)</sup>	Contact angle	$\gamma_s = 40.0$ mJ/m <sup>2</sup> ( $\gamma_s^{LW} = 40.0$ , $\gamma_s^{AB} = 0.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 14.6$ ); 20°C	Test liquids: water, alpha-bromonaphthalene, diiodomethane, formamide, and glycerin; acid-base analysis.
Janczuk, 1988 <sup>(107)</sup>	Contact angle	$\gamma_s = 44.9$ mJ/m <sup>2</sup> ( $\gamma_s^d = 39.0$ ; $\gamma_s^p = 6.0$ ); no temp cited	Various test liquids, by geometric mean equation.
Janczuk, 1989 <sup>(108)</sup>	Contact angle	$\gamma_s = 45.0$ mJ/m <sup>2</sup> ( $\gamma_s^d = 38.3$ ; $\gamma_s^p = 6.8$ ); no temp cited	Various test liquids, by harmonic-geometric mean equation.
Janczuk, 1989 <sup>(108)</sup>	Contact angle	$\gamma_s = 46.7$ mJ/m <sup>2</sup> ( $\gamma_s^d = 34.6$ ; $\gamma_s^p = 12.1$ ); no temp cited	Various test liquids, by harmonic mean equation.
van Oss, 1990 <sup>(2)</sup>	Contact angle	$\gamma_s = 43.2$ mJ/m <sup>2</sup> ( $\gamma_s^{LW} = 43.2$ , $\gamma_s^{AB} = 0.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 22.4$ ); 20°C	Test liquids water, alpha-bromonaphthalene, diiodomethane, formamide, and glycerin; acid-base analysis.
van Oss, 1990 <sup>(2)</sup>	Contact angle	$\gamma_s = 41.4$ mJ/m <sup>2</sup> ( $\gamma_s^{LW} = 41.4$ , $\gamma_s^{AB} = 0.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 12.2$ ); 20°C	Test liquids: water, alpha-bromonaphthalene, diiodomethane, formamide, and glycerin; acid-base analysis.
Janczuk, 1990 <sup>(105)</sup>	Contact angle	$\gamma_s = 43.2$ mJ/m <sup>2</sup> ; no temp cited	Test liquids: water and diiodomethane.
Janczuk, 1990 <sup>(105)</sup>	Contact angle	$\gamma_s = 41.5$ mJ/m <sup>2</sup> ; no temp cited	Averaged over 28 test liquids.
Berger, 1991 <sup>(145)</sup>	Contact angle	$\gamma_s = 43.9$ mJ/m <sup>2</sup> ( $\gamma_s^d = 37.2$ ; $\gamma_s^p = 6.7$ ); no temp cited	Various test liquids, by geometric mean equation; surface cleaned with acetone.
Berger, 1991 <sup>(145)</sup>	Contact angle	$\gamma_s = 41.7$ mJ/m <sup>2</sup> ( $\gamma_s^d = 37.6$ ; $\gamma_s^p = 4.1$ ); no temp cited	Various test liquids, by geometric mean equation; surface cleaned with dichloromethane.
Berger, 1991 <sup>(145)</sup>	Contact angle	$\gamma_s = 42.9$ mJ/m <sup>2</sup> ( $\gamma_s^d = 38.6$ ; $\gamma_s^p = 4.3$ );	Various test liquids, by geometric mean equation; surface

Ruckenstein, 1993 <sup>(6)</sup>	Contact angle	no temp cited $\gamma_s = 51.2 \text{ mJ/m}^2$ ( $\gamma_s^d = 39.4$ ; $\gamma_s^p = 11.8$ ); no temp cited	cleaned with detergent. Octane droplets and air bubbles submersed in water; geometric mean equation
Fukuzawa, 1994 <sup>(113)</sup>	Contact angle	$\gamma_s = 41.1 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 40.2$ , $\gamma_s^{AB} = 0.9$ , $\gamma_s^+ = 0.02$ , $\gamma_s^- = 12.2$ ); no temp cited	Test liquids: water, formamide, and diiodomethane; acid-base analysis, calculated per Good and van Oss <sup>(86)</sup> . Contact angles measured after stabilizing for 15 secs.
Fukuzawa, 1994 <sup>(113)</sup>	Contact angle	$\gamma_s = 48.8 \text{ mJ/m}^2$ ; no temp cited	Test liquids: water, formamide, and diiodomethane; acid-base analysis calculated by arithmetic and geometric means.
Hwang, 1995 <sup>(257)</sup>	Contact angle	$\gamma_s = 38.5 \text{ mJ/m}^2$ ; no temp cited	Test liquids not known.
Lloyd, 1995 <sup>(218)</sup>	Contact angle	$\gamma_s^{LW} = 35.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 12.2$ ; no temp cited	Test liquids not known; acid-base analysis.
Lee, 1999 <sup>(116)</sup>	Contact angle	$\gamma_s = 43.2 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 43.2$ , $\gamma_s^{AB} = 0.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 8.8$ ); 20°C	Test liquids: water, alpha-bromonaphthalene, diiodomethane, formamide, and glycerin; acid-base analysis, based on reference values for water of $\gamma^+ = 34.2 \text{ mJ/m}^2$ and $\gamma = 19 \text{ mJ/m}^2$ .
Morra, 1999 <sup>(134)</sup>	Contact angle	$\gamma_s = 37.7 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 37.4$ , $\gamma_s^{AB} = 0.3$ , $\gamma_s^+ = 0.01$ , $\gamma_s^- = 2.2$ ); no temp cited	Test liquids not known; acid-base analysis based on reference values for water of $\gamma^+ = 48.5 \text{ mJ/m}^2$ and $\gamma = 11.2 \text{ mJ/m}^2$ .
Etzler, 2000 <sup>(171)</sup>	Contact angle	$\gamma_s = 40.5 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 40.5$ , $\gamma_s^{AB} = 0.0$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 6.8$ ); 20°C	Various test liquids; acid-base analysis, by Good-van Oss method. Commercial sample, unknown plasticizer content.
Kwok, 2000 <sup>(166)</sup>	Contact angle	$\gamma_c = 38.3 \text{ mJ/m}^2$ ; no temp cited	Re-calculated by equation of state method from data produced by Kwok, 1998 <sup>(170)</sup> .
Kwok, 2000 <sup>(166)</sup>	Contact angle	$\gamma_c = 38.2 \text{ mJ/m}^2$ ; no temp cited	Re-calculated by alternate equation of state method from data produced by Kwok, 1998 <sup>(170)</sup> .
McCafferty, 2000 <sup>(217)</sup>	Contact angle	$\gamma_s = 48.9 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 46.5$ , $\gamma_s^{AB} = 2.4$ , $\gamma_s^+ = 0.08$ , $\gamma_s^- = 18.1$ ); no temp cited	Test liquids: water, diiodomethane, formamide, glycerin, and ethylene glycol; acid-base analysis. Cleaned with methanol wipe.
Della Volpe, 2002 <sup>(141)</sup>	Contact angle	$\gamma_s = 42.3 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 41.6$ , $\gamma_s^{AB} = 0.7$ , $\gamma_s^+ = 0.0$ , $\gamma_s^- = 5.3$ ); no temp cited	Various test liquids; acid-base analysis based on reference values for water of $\gamma^+ = 48.5 \text{ mJ/m}^2$ and $\gamma = 11.2 \text{ mJ/m}^2$ ; from advancing contact angles.
Della Volpe, 2002 <sup>(141)</sup>	Contact angle	$\gamma_s = 45.2 \text{ mJ/m}^2$ ( $\gamma_s^{LW} = 43.1$ , $\gamma_s^{AB} = 2.1$ , $\gamma_s^+ = 0.1$ , $\gamma_s^- = 7.6$ ); no temp cited	Various test liquids; acid-base analysis based on reference values for water of $\gamma^+ = 48.5 \text{ mJ/m}^2$ and $\gamma = 11.2 \text{ mJ/m}^2$ ; from equilibrium (average of advancing and receding) contact angles.
<sup>(e)</sup> Cho, 2005 <sup>(226)</sup>	Contact angle	$\gamma_s = 42 \text{ mJ/m}^2$ ( $\gamma_s^d = 20$ , $\gamma_s^p = 22$ ); no temp cited	Test liquids: water and formamide.
Wu, 1970 <sup>(35)</sup>	From polymer melt	$\gamma_s = 41.1 \text{ mJ/m}^2$ ( $\gamma_s^d = 29.6$ ; $\gamma_s^p = 11.5$ ); 20°C	Measurement by pendant drop of polymer melt extrapolated to 20°C; polarity calculated from interfacial tension with PE by harmonic mean. $M_v = 3000$ .
Wu, 1971 <sup>(29)</sup>	From polymer melt	$\gamma_s = 41.1 \text{ mJ/m}^2$ ( $\gamma_s^d = 29.0$ , $\gamma_s^p = 12.1$ ); 20°C	Measurement by pendant drop of polymer melt extrapolated to 20°C; polarity calculated from interfacial tension with PE by geometric mean equation.
Wu, 1979 <sup>(45)</sup>	From polymer melt	$\gamma_s = 41.4 \text{ mJ/m}^2$ ; 20°C	Direct measurement of polymer melt extrapolated to 20°C.
Wu, 1968 <sup>(182)</sup>	Calculated	$\gamma_s = 36 \text{ mJ/m}^2$ ; 20°C	Calculated from molecular constitution.
Wu, 1970 <sup>(35)</sup>	Calculated	$\gamma_s = 41.1 \text{ mJ/m}^2$ ; 20°C	Calculated from parachor and molecular weight.

Sewell, 1971 <sup>(193)</sup>	Calculated	$\gamma_s = 35.1 \text{ mJ/m}^2$ ; no temp cited	Calculated by least squares from cohesive energy and molar volume.
Van Krevelen, 1976 <sup>(85)</sup>	Calculated	$\gamma_s = 42 \text{ mJ/m}^2$ ; no temp cited	Calculated from parachor parameter.
Omenyi, 1980 <sup>(266)</sup>	Calculated	$\theta_w^Y = 74.6^\circ$ ; 20°C	Calculated from critical velocities of PMMA powder in salol, naphthalene, and biphenyl.
Omenyi, 1980 <sup>(266)</sup>	Calculated	$\gamma_s = 38.6 \text{ mJ/m}^2$ ; 20°C	Calculated from critical velocities of PMMA powder in salol, naphthalene, and biphenyl.
Wu, 1982 <sup>(50)</sup>	Calculated	$\theta_w = 68^\circ$ ; 20°C	Calculated from the theory of fractional polarity by geometric mean equation.
Wu, 1982 <sup>(50)</sup>	Calculated	$\theta_w = 78^\circ$ ; 20°C	Calculated from the theory of fractional polarity by harmonic mean equation.
Wu, 1982 <sup>(18)</sup>	Calculated	$\gamma_s = 36.9 \text{ mJ/m}^2$ ; 20°C	Calculated from cohesive energy density and solubility parameters.
Pritykin, 1986 <sup>(199)</sup>	Calculated	$\gamma_s = 35.5 \text{ mJ/m}^2$ ; no temp cited	Calculated from cohesion parameters and monomer refractometric characteristics, equation 1.
Pritykin, 1986 <sup>(199)</sup>	Calculated	$\gamma_s = 36.6 \text{ mJ/m}^2$ ; no temp cited	Calculated from cohesion parameters and monomer refractometric characteristics, equation 2.
Van Ness, 1992 <sup>(186)</sup>	Calculated	$\gamma_s = 37.7 \text{ mJ/m}^2$ ; 20°C	Calculated molten surface tension value, extrapolated to 20°C.
<sup>(d)</sup> Mangipudi, 1996 <sup>(269)</sup>	Other	$\gamma_s = 53 \text{ mJ/m}^2$ ; no temp cited	Measured by contact deformation per Johnson-Kendall-Roberts method.

