














## Overview of materials for Polylactic Acid (PLA) Biopolymer

Categories: [Polymer](#); [Thermoplastic](#); [Polylactic Acid \(PLA\) Biopolymer](#)

**Material Notes:** This property data is a summary of similar materials in the MatWeb database for the category "Polylactic Acid (PLA) Biopolymer". Each property range of values reported is minimum and maximum values of appropriate MatWeb entries. The comments report the average value, and number of data points used to calculate the average. The values are not necessarily typical of any specific grade, especially less common values and those that can be most affected by additives or processing methods.

**Vendors:** No vendors are listed for this material. Please [click here](#) if you are a supplier and would like information on how to add your listing to this material.

Physical Properties	Metric	English	Comments
Density	1.00 - 3.41 g/cc	0.0361 - 0.123 lb/in <sup>3</sup>	Average value: 1.30 g/cc Grade Count:286
	1.08 - 1.21 g/cc @Temperature 230 - 230 °C	0.0390 - 0.0437 lb/in <sup>3</sup> @Temperature 446 - 446 °F	Average value: 1.09 g/cc Grade Count:16
Water Absorption	0.130 - 2.40 %	0.130 - 2.40 %	Average value: 2.01 % Grade Count:17
Moisture Absorption at Equilibrium	0.0600 - 2.00 %	0.0600 - 2.00 %	Average value: 0.244 % Grade Count:11
	0.550 - 1.30 % @Temperature 70.0 - 70.0 °C	0.550 - 1.30 % @Temperature 158 - 158 °F	Average value: 0.950 % Grade Count:1
	0.550 - 1.30 % @Time 180000 - 1.44e+6 sec	0.550 - 1.30 % @Time 50.0 - 400 hour	Average value: 0.950 % Grade Count:1
Additive Loading	10.0 - 40.0 %	10.0 - 40.0 %	Average value: 20.0 % Grade Count:14
Moisture Vapor Transmission	8.30 - 15.7 cc-mm/m <sup>2</sup> -24hr-atm	21.1 - 39.9 cc-mil/100 in <sup>2</sup> -24hr-atm	Average value: 11.5 cc-mm/m <sup>2</sup> -24hr-atm Grade Count:4
Water Vapor Transmission	3.88 - 170 g/m <sup>2</sup> /day	0.250 - 10.9 g/100 in <sup>2</sup> /day	Average value: 103 g/m <sup>2</sup> /day Grade Count:8
Oxygen Transmission	14.0 - 27.6 cc-mm/m <sup>2</sup> -24hr-atm	35.6 - 70.1 cc-mil/100 in <sup>2</sup> -24hr-atm	Average value: 20.3 cc-mm/m <sup>2</sup> -24hr-atm Grade Count:4
Oxygen Transmission Rate	130 - 1450 cc/m <sup>2</sup> /day	8.37 - 93.4 cc/100 in <sup>2</sup> /day	Average value: 889 cc/m <sup>2</sup> /day Grade Count:7
Nitrogen Transmission	1.65 - 7.29 cc-mm/m <sup>2</sup> -24hr-atm	4.18 - 18.5 cc-mil/100 in <sup>2</sup> -24hr-atm	Average value: 4.74 cc-mm/m <sup>2</sup> -24hr-atm Grade Count:4
Carbon Dioxide Transmission	76.0 - 118 cc-mm/m <sup>2</sup> -24hr-atm	193 - 300 cc-mil/100 in <sup>2</sup> -24hr-atm	Average value: 94.0 cc-mm/m <sup>2</sup> -24hr-atm Grade Count:4
Maximum Moisture Content	0.0200 - 0.0800	0.0200 - 0.0800	Average value: 0.0320 Grade Count:5
Linear Mold Shrinkage	>= 0.000600 cm/cm	>= 0.000600 in/in	
Linear Mold Shrinkage, Transverse	0.00150 - 0.00650 cm/cm	0.00150 - 0.00650 in/in	Average value: 0.00369 cm/cm Grade Count:9
Melt Flow	0.200 - 92.8 g/10 min	0.200 - 92.8 g/10 min	Average value: 12.8 g/10 min Grade Count:232
Mechanical Properties	Metric	English	Comments
Hardness, Rockwell R	94.0 - 118	94.0 - 118	Average value: 105 Grade Count:20
Hardness, Shore A	63.0 - 87.0	63.0 - 87.0	Average value: 76.8 Grade Count:8
Hardness, Shore D	34.0 - 87.0	34.0 - 87.0	Average value: 69.0 Grade Count:19
Ball Indentation Hardness	105 - 190 MPa	15200 - 27600 psi	Average value: 131 MPa Grade Count:4
Tensile Strength, Ultimate	0.160 - 3000 MPa	23.2 - 435000 psi	Average value: 57.3 MPa Grade Count:191
	5.00 - 42.0 MPa @Temperature 30.0 - 110 °C	725 - 6090 psi @Temperature 86.0 - 230 °F	Average value: 27.8 MPa Grade Count:2
Film Tensile Strength at Yield, MD	19.0 - 54.0 MPa	2760 - 7830 psi	Average value: 30.5 MPa Grade Count:13
Film Tensile Strength at Yield, TD	14.0 - 48.0 MPa	2030 - 6960 psi	Average value: 26.5 MPa Grade Count:13
Tensile Strength, Yield	8.00 - 103 MPa	1160 - 14900 psi	Average value: 45.2 MPa Grade Count:78
	46.0 - 49.0 MPa @Temperature 30.0 - 110 °C	6670 - 7110 psi @Temperature 86.0 - 230 °F	Average value: 47.8 MPa Grade Count:2
Film Elongation at Break, MD	2.00 - 4550 %	2.00 - 4550 %	Average value: 489 % Grade Count:48
Film Elongation at Break, TD	2.00 - 3980 %	2.00 - 3980 %	Average value: 554 % Grade Count:48
Elongation at Break	0.500 - 1400 %	0.500 - 1400 %	Average value: 69.4 % Grade Count:256
	15.0 - 100 % @Temperature 30.0 - 110 °C	15.0 - 100 % @Temperature 86.0 - 230 °F	Average value: 41.3 % Grade Count:2
Elongation at Yield	1.00 - 400 %	1.00 - 400 %	Average value: 26.7 % Grade Count:55
	2.00 - 2.00 % @Temperature 30.0 - 110 °C	2.00 - 2.00 % @Temperature 86.0 - 230 °F	Average value: 2.00 % Grade Count:2
Modulus of Elasticity	0.00232 - 13.8 GPa	0.336 - 2000 ksi	Average value: 2.35 GPa Grade Count:226
	2.96 - 3.60 GPa @Temperature 30.0 - 110 °C	429 - 522 ksi @Temperature 86.0 - 230 °F	Average value: 5.92 GPa Grade Count:2
	6.10 - 8.90 GPa @Temperature 70.0 - 70.0 °C	885 - 1290 ksi @Temperature 158 - 158 °F	Average value: 5.92 GPa Grade Count:1
	6.10 - 8.90 GPa @Time 0.000 - 1.44e+6 sec	885 - 1290 ksi @Time 0.000 - 400 hour	Average value: 5.92 GPa Grade Count:1
Tenacity	0.177 - 0.530 N/tex	2.00 - 6.00 g/denier	Average value: 0.307 N/tex Grade Count:11
Flexural Yield Strength	0.170 - 159 MPa	24.7 - 23000 psi	Average value: 77.4 MPa Grade Count:125
	79.0 - 93.0 MPa @Temperature 30.0 - 110 °C	11500 - 13500 psi @Temperature 86.0 - 230 °F	Average value: 85.0 MPa Grade Count:2
Flexural Modulus	0.167 - 13.8 GPa	24.2 - 2000 ksi	Average value: 3.38 GPa Grade Count:146
	2.96 - 3.60 GPa @Temperature 30.0 - 110 °C	429 - 522 ksi @Temperature 86.0 - 230 °F	Average value: 3.28 GPa Grade Count:2
Flexural Strain at Break	1.70 - 5.50 %	1.70 - 5.50 %	Average value: 3.49 % Grade Count:12
Secant Modulus	0.120 - 0.650 GPa	17.4 - 94.3 ksi	Average value: 0.354 GPa Grade Count:5
Secant Modulus, MD	3.30 - 3.44 GPa	479 - 499 ksi	Average value: 3.35 GPa Grade Count:3
Secant Modulus, TD	3.78 - 3.90 GPa	549 - 566 ksi	Average value: 3.85 GPa Grade Count:3
Izod Impact, Notched	0.105 - 8.54 J/cm	0.197 - 16.0 ft-lb/in	Average value: 1.39 J/cm Grade Count:84
	0.490332 - 2.44 J/cm @Temperature -40.0 - -30.0 °C	0.918594 - 4.57 ft-lb/in @Temperature -40.0 - -22.0 °F	Average value: 0.929 J/cm Grade Count:16
Izod Impact, Unnotched	1.92 - 5340 J/cm	3.60 - 10000 ft-lb/in	Average value: 5.87 J/cm Grade Count:38
	980.567 - 980.567 J/cm @Temperature -30.0 - -30.0 °C	1837.00 - 1837.00 ft-lb/in @Temperature -22.0 - -22.0 °F	Grade Count:1
Izod Impact, Notched (ISO)	1.60 - 32.5 kJ/m <sup>2</sup>	0.761 - 15.5 ft-lb/in <sup>2</sup>	Average value: 11.9 kJ/m <sup>2</sup> Grade Count:20
	9.00 - 40.0 kJ/m <sup>2</sup> @Temperature -40.0 - 110 °C	4.28 - 19.0 ft-lb/in <sup>2</sup> @Temperature -40.0 - 230 °F	Average value: 17.9 kJ/m <sup>2</sup> Grade Count:7
Izod Impact, Unnotched (ISO)	4.70 kJ/m <sup>2</sup> - NB	2.24 ft-lb/in <sup>2</sup> - NB	Average value: 20.1 kJ/m <sup>2</sup> Grade Count:11

	38.0 kJ/m <sup>2</sup> - NB @Temperature 30.0 - 110 °C	18.1 ft-lb/in <sup>2</sup> - NB @Temperature 86.0 - 230 °F	Average value: 64.5 kJ/m <sup>2</sup> Grade Count:2
Charpy Impact Unnotched	0.430 J/cm <sup>2</sup> - NB 999.9 - 999.9 J/cm <sup>2</sup> @Temperature 30.0 - 110 °C	2.05 ft-lb/in <sup>2</sup> - NB 4759 - 4759 ft-lb/in <sup>2</sup> @Temperature 86.0 - 230 °F	Average value: 2.56 J/cm <sup>2</sup> Grade Count:92 Grade Count:1
Charpy Impact, Notched	0.100 - 1000 J/cm <sup>2</sup> 2.50 - 6.70 J/cm <sup>2</sup> @Temperature 30.0 - 110 °C	0.476 - 4760 ft-lb/in <sup>2</sup> 11.9 - 31.9 ft-lb/in <sup>2</sup> @Temperature 86.0 - 230 °F	Average value: 0.766 J/cm <sup>2</sup> Grade Count:76 Average value: 4.60 J/cm <sup>2</sup> Grade Count:1
Coefficient of Friction	0.150 - 0.280	0.150 - 0.280	Average value: 0.195 Grade Count:11
Coefficient of Friction, Static	0.160 - 0.340	0.160 - 0.340	Average value: 0.266 Grade Count:11
Tear Strength	12.0 - 180 kN/m	68.5 - 1030 pli	Average value: 80.3 kN/m Grade Count:12
Elmendorf Tear Strength MD	10.0 - 499 g	10.0 - 499 g	Average value: 312 g Grade Count:6
Elmendorf Tear Strength TD	110 - 567 g	110 - 567 g	Average value: 323 g Grade Count:6
Elmendorf Tear Strength, MD	0.0441 - 0.862 g/micron	1.12 - 21.9 g/mil	Average value: 0.426 g/micron Grade Count:16
Elmendorf Tear Strength, TD	0.0361 - 1.28 g/micron	0.918 - 32.6 g/mil	Average value: 0.510 g/micron Grade Count:16
Dart Drop Total Energy	240 - 420 J/cm	0.450 - 0.787 ft-lb/mil	Average value: 347 J/cm Grade Count:3
Dart Drop Test	0.00350 - 780 g	0.00000772 - 1.72 lb	Average value: 199 g Grade Count:10
Film Tensile Strength at Break, MD	11.3 - 110 MPa	1640 - 16000 psi	Average value: 29.8 MPa Grade Count:41
Film Tensile Strength at Break, TD	10.3 - 145 MPa	1490 - 21000 psi	Average value: 31.1 MPa Grade Count:41

Electrical Properties	Metric	English	Comments
Electrical Resistivity	1.00e+8 - 1.00e+15 ohm-cm	1.00e+8 - 1.00e+15 ohm-cm	Average value: 6.67e+14 ohm-cm Grade Count:6
Surface Resistance	1.00e+10 - 1.00e+15 ohm	1.00e+10 - 1.00e+15 ohm	Average value: 6.67e+14 ohm Grade Count:6
Dielectric Constant	1.51 - 2.70	1.51 - 2.70	Average value: 2.29 Grade Count:3
Dissipation Factor	0.00300 - 0.0140	0.00300 - 0.0140	Average value: 0.00750 Grade Count:3

Thermal Properties	Metric	English	Comments
CTE, linear	101 - 120 µm/m-°C	56.1 - 66.7 µin/in-°F	Average value: 114 µm/m-°C Grade Count:3
Thermal Conductivity	0.0320 - 0.170 W/m-K	0.222 - 1.18 BTU-in/hr-ft <sup>2</sup> -°F	Average value: 0.0439 W/m-K Grade Count:4
Melting Point	64.0 - 220 °C	147 - 428 °F	Average value: 154 °C Grade Count:124
Maximum Service Temperature, Air	52.0 - 240 °C	126 - 464 °F	Average value: 175 °C Grade Count:30
Deflection Temperature at 0.46 MPa (66 psi)	50.0 - 160 °C	122 - 320 °F	Average value: 86.1 °C Grade Count:140
Deflection Temperature at 1.8 MPa (264 psi)	44.0 - 149 °C	111 - 300 °F	Average value: 82.6 °C Grade Count:53
Vicat Softening Point	44.0 - 160 °C	111 - 320 °F	Average value: 85.5 °C Grade Count:64
Glass Transition Temp, Tg	-43.0 - 120 °C	-45.4 - 248 °F	Average value: 57.1 °C Grade Count:65
Flammability, UL94	HB - V-0	HB - V-0	Grade Count:20

Optical Properties	Metric	English	Comments
Haze	2.00 - 85.0 %	2.00 - 85.0 %	Average value: 30.8 % Grade Count:7
Gloss	90.0 %	90.0 %	Average value: 90.0 % Grade Count:4
Transmission, Visible	90.0 %	90.0 %	Average value: 90.0 % Grade Count:13

Processing Properties	Metric	English	Comments
Processing Temperature	25.0 - 330 °C	77.0 - 626 °F	Average value: 184 °C Grade Count:71
Nozzle Temperature	140 - 295 °C	284 - 563 °F	Average value: 196 °C Grade Count:61
Adapter Temperature	185 - 210 °C	365 - 410 °F	Average value: 203 °C Grade Count:12
Die Temperature	20.0 - 260 °C	68.0 - 500 °F	Average value: 178 °C Grade Count:45
Melt Temperature	60.0 - 300 °C	140 - 572 °F	Average value: 182 °C Grade Count:139
Mold Temperature	10.0 - 220 °C	50.0 - 428 °F	Average value: 64.1 °C Grade Count:120
Injection Velocity	30.0 - 203 mm/sec	1.18 - 8.00 in/sec	Average value: 36.5 mm/sec Grade Count:15
Drying Temperature	40.0 - 110 °C	104 - 230 °F	Average value: 69.0 °C Grade Count:154
	45.0 - 80.0 °C @Temperature 4.00 - 8.00 °C	113 - 176 °F @Temperature 39.2 - 46.4 °F	Average value: 56.3 °C Grade Count:4
Moisture Content	0.0100 - 2.00 %	0.0100 - 2.00 %	Average value: 0.211 % Grade Count:87
	0.150 - 0.300 % @Temperature 100 - 100 °C	0.150 - 0.300 % @Temperature 212 - 212 °F	Average value: 0.192 % Grade Count:13
Dew Point	-40.0 - -35.0 °C	-40.0 - -31.0 °F	Average value: -38.1 °C Grade Count:99
Drying Air Flow Rate	14.2 l/min	0.500 ft <sup>3</sup> /min (CFM)	Average value: 14.2 l/min Grade Count:24
Injection Pressure	55.2 - 138 MPa	8000 - 20000 psi	Average value: 81.4 MPa Grade Count:35

Some of the values displayed above may have been converted from their original units and/or rounded in order to display the information in a consistent format. Users requiring more precise data for scientific or engineering calculations can click on the property value to see the original value as well as raw conversions to equivalent units. We advise that you only use the original value or one of its raw conversions in your calculations to minimize rounding error. We also ask that you refer to MatWeb's [terms of use](#) regarding this information. [Click here](#) to view all the property values for this datasheet as they were originally entered into MatWeb.