

# NatureWorks® 2003D

NatureWorks® PLA polymer 2003D is a thermoplastic resin derived from annually renewable resources. PLA polymer 2003D processes easily on conventional extrusion equipment. Specifically designed for use in fresh food packaging and food serviceware applications. Ingeo biopolymer 2003D is a transparent general purpose extrusion grade that is used naturally or as part of a formulated blend. This is a high molecular weight biopolymer grade.

Physical Properties	Metric	English	Comments
Specific Gravity	1.24 g/cc	1.24 g/cc	ASTM D792
Viscosity Measurement	4.0 @Temperature 30.0 °C	4.0 @Temperature 86.0 °F	1.0 g/dl in chloroform; Relative Viscosity
Melt Flow	6.0 g/10 min @Load 2.16 kg, Temperature 210 °C	6.0 g/10 min @Load 4.76 lb, Temperature 410 °F	ASTM D1238

Mechanical Properties	Metric	English	Comments
Tensile Strength at Break	53.0 MPa	7690 psi	ASTM D882
Tensile Strength, Yield	60.0 MPa	8700 psi	ASTM D882
Elongation at Break	6.0 %	6.0 %	ASTM D882
Tensile Modulus	3.61 GPa	524 ksi	ASTM D882
Flexural Strength	82.7 MPa	12000 psi	ASTM D790
Flexural Modulus	3.83 GPa	555 ksi	ASTM D790
Izod Impact, Notched	0.1600 J/cm	0.2997 ft-lb/in	ASTM D256

Thermal Properties	Metric	English	Comments
Melting Point	145 - 160 °C	293 - 320 °F	Peak; ASTM D3418

Deflection Temperature at 0.46 MPa (66 psi)	55.0 °C	131 °F	ASTM E2092
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Glass Transition Temp, Tg	55.0 - 60.0 °C	131 - 140 °F	ASTM D3418
Optical Properties	Metric	English	Comments
Transmission, Visible	90 %	90 %	Thickness Unknown
Processing Properties	Metric	English	Comments
Feed Temperature	180 °C	356 °F	
Adapter Temperature	200 °C	392 °F	
Die Temperature	190 °C	374 °F	
Melt Temperature	210 °C	410 °F	
Drying Temperature	90.0 °C @Time 7200 sec	194 °F @Time 2.00 hour	
Moisture Content	<= 0.025 %	<= 0.025 %	
Dew Point	-40.0 °C	-40.0 °F	
Drying Air Flow Rate	>= 14.2 l/min	>= 0.500 ft <sup>3</sup> /min (CFM)	
Screw Speed	20 - 100 rpm	20 - 100 rpm	