EMNANDI BIOPLASTICS
BEYOND NET ZERO

Technical Data Sheet

BIOMAT PLA A341D

A thermoplastic resin composed primarily of poly(lactic acid) which is both renewable and industrially compostable. It is produced from the fermentation of sugar or corn to produce lactic acid, followed by polymerisation via the intermediate lactide. It has a considerably lower carbon footprint than fossil-fuel based plastics and can be both mechanically and chemically recycled.

This grade has been specifically developed to enhance PLA's film-forming properties resulting in a material with higher tensile elongation and flexibility. In addition to its application in flexible packaging it is also suitable for 3D printing and textiles. It is food contact acceptable and can be readily processed by both extrusion and thermoforming.

Applications	Features
Packaging	Excellent Printability
Drinking Straws	Tough
Bi-Axially Oriented Film	High Gloss
Fabrics/Textiles	Good Processability
Laminates	
3D Printing	

Sustainability	
Bio-Based Content	100%
Compostability	Industrially Compostable

Physical Properties				
Density	1.23 - 1.26	g/cm³	GB/T 1033.1-20	
Melt Mass Flow Rate	1.5 - 5	g/10min	GB/T 3682.1-20	(190°C/2.16 kg)

Mechanical Properties				
Charpy Impact Strength	2.5 - 3.5	kJ/m²	GB/T 1043.1-20	
Flexural Modulus	2450	MPa	GB/T 1040.1-20	
Flexural Strength	74	MPa	GB/T 1040.1-20	
Shrinkage	0.4	%		Flow
Tensile Elongation	220	%	GB/T 1040.1-20	At Break
Tensile Modulus	887 - 3560	MPa	Estimated**	
Tensile Strength	45 - 50	MPa	GB/T 1040.1-20	

Film Properties				
Film Thickness	25	µm		
Film Thickness	35	µm		
Tear Strength	190	MPa	GB/T 13519-20	Machine Direction: 25µm
Tear Strength	284	MPa	GB/T 13519-20	Transverse Direction: 25µm
Tear Strength	169	MPa	GB/T 13519-20	Machine Direction: 35µm
Tear Strength	170	MPa	GB/T 13519-20	Transverse Direction: 35µm
Tensile Elongation	190.3	%	GB/T 13519-2016	Machine Direction: 25µm, at break
Tensile Elongation	106.5	%	GB/T 13519-2016	Transverse Direction: 25µm, at break
Tensile Elongation	50.2	%	GB/T 13519-2016	Machine Direction: 35µm at break
Tensile Elongation	82.7	%	GB/T 13519-2016	Transverse Direction: 35µm at break
Tensile Strength	48	MPa	GB/T 13519-20	Machine Direction: 25µm
Tensile Strength	40	MPa	GB/T 13519-20	Transverse Direction: 25µm
Tensile Strength	45	MPa	GB/T 13519-20	Machine Direction: 35µm
Tensile Strength	40	MPa	GB/T 13519-20	Transverse Direction: 35µm
Thermal Properties				
Glass Transition Temperature	55 - 58	°C	GB/T 19466.2-2	
Heat Sealing Strength	8	N/15mm		25µm
Heat Sealing Strength	12	N/15mm		35µm
Melt Temperature	160 - 172	°C	GB/T 19466.3-2	
Moisture Vapour Transmission Rate	163	g/m²·24h		25µm
Moisture Vapour Transmission Rate	126	g/m²·24h		35µm
Optical Parameters				
Haze	20.7	%		
Haze 25µm	2.8	%		25µm
Haze 35µm	0.9	%		35µm
Light Transmittance	84.8	%		
Light Transmittance 25µm	93.1	%		25µm
Light Transmittance 35µm	93.6	%		35µm

Processing Methods

3D Printing

Film Extrusion

Thermoforming

Appearance

Clear/Transparent

Notes

Drying
PLA is a hygroscopic thermoplastic that readily absorbs water from the atmosphere. The presence of even small amounts of moisture will hydrolyse PLA in the melt phase, reducing molecular weight and causing loss of properties. Prior to injection moulding, we recommend that all PLA containing compounds be dried to a moisture content below 0.02% (200 ppm) using a desiccant dryer with the capability of delivering air with a dew point of -40°F (-40°C).

Most PLA compounds supplied will have amorphous pellets. These pellets can become sticky/tacky on the surface when heated above their glass transition temperature (Tg) of 130°F (55°C). It is important that drying temperatures do not exceed 130°F (55°C) or pellets will stick together and will not flow out of the dryer. Alloys with other polymers, ie PLA/PC hybrids, can be dried at higher temperatures.

Amorphous versus Crystalline Morphology
PLA is truly a semi-crystalline resin and by choice of whether or not to include a nucleating agent and choice of mould temperatures, one can dictate whether the final part will have amorphous or crystalline morphology.

If the application will not be exposed to temperatures above 120°F (50°C), it is acceptable to mould PLA in the amorphous morphology. Amorphous morphology is achieved by not adding any nucleating agents and using a mould surface temperature that is controlled to a temperature of less than 75°F (24°C). Mould temperatures higher than this will cause parts to stick in the mould and be very soft and flexible upon ejection.

If application will be exposed to temperatures above the Tg of 130°F (55°C) regardless of pressure, or will be exposed to above 120°F (50°C) while under moderate pressure, ie 50 psi (340 KPa), it is recommended that the PLA be in the crystalline state. Crystalline morphology is achieved by adding a nucleating agent. The mould surface temperature must be controlled at a temperature above 180°F (82°C), preferably about 220°F (105°C), and mould closed time must typically exceed 60 seconds for standard cycle or 40 seconds for fast cycle nucleating agent. This is typical for 1/8 inch (0.32 cm) thick parts. Thinner parts may be ejected at reduced cycle times depending on sprue & runner thickness and ejector design. Mould temperatures of less than 180°F (82°C) or shorter cycle times will cause parts to stick in the mould and be very flexible upon ejection. It may sound counter-intuitive, but for a nucleated PLA you want to raise your mould temperature to above 200°F (93°C) to make the part stiffer upon ejection.

Typical trouble shooting sequence for a poor ejecting nucleated PLA part is:
Turn up mould temperature to above 200°F (93°)
Increase closed mould time (above 60 seconds for standard cycle nucleating agent and above 40 seconds for fast cycle nucleating agent)
Decrease melt temperature as low as possible
The above recommendations are not applicable to PLA that is alloyed or blended with another polymer, ie PLA/PC hybrids, as the other polymer will usually suppress the ability of PLA to crystallise. Detailed moulding conditions for these alloys are given on the product data sheet for the specific formulation.

Estimated Properties

Properties identified as 'Estimated**' have been estimated from the generic equivalent. These are provided for comparative purposes and are not reflective of the actual grade as the relevant data is not available.

Storage Recommendations

Keep dry at ambient temperature. Store indoors avoiding a humid environment, heat and direct sunlight. Use material within 6 months after delivery date, in order to prevent possible material quality deterioration.