

DuPont™ Biomax® Thermal 300

Biomax® Thermal Resins Product Data Sheet

Description

Product Description

Biomax® Thermal 300 is an ethylene copolymer with a nucleating agent designed to modify Polylactic Acid (PLA) for improved thermal and toughness properties in packaging and industrial applications. Some of the attributes of Biomax® Thermal 300 in PLA include:

- Reduced distortion and shrinkage of thermoformed articles at temperatures up to 90 C;
- Allows for short cycle time two-stage molding
- Engineered for PLA providing rapid melt-dispersion, even with single screw extruders, and reducing extruder power requirements;
- Pelletized, efficient extruder feeding; separately or as a pellet-bend with PLA;

Blends with PLA will typically comprise 5% or less of Biomax® Thermal 300. At these levels, contact clarity is still maintained.

In addition to improving the thermal stability of thermoformed articles, Biomax® Thermal 300 provides some of the processing and toughness advantages of Biomax® Strong 120 to PLA.

Restrictions

Material Status

- Developmental: Active

Availability

- Globally

Typical Characteristics

Uses

- Plastics Modification

Characteristics / Benefits

Thermal Stability of Thermoformed Articles

Thermoformed articles made from amorphous PLA typically deform when exposed to temperatures above the glass transition temperature of around 55 C. Adding 2 to 4% Biomax® Thermal 300 to Natureworks Ingeo™ PLA resins raises the end-use temperature threshold to 90 C or higher, substantially reducing shrinkage and improving dimensional stability while only minimally increasing haze. Biomax® Thermal 300 works best in a two-stage (hot and cold mold) thermoforming process.

Biomax® Thermal 300 modifier addition is valid for PLA manufactured and marketed by Natureworks LLC. Please consult your DuPont sales representative before using Biomax® Thermal in applications using PLA supplied by other manufacturers.

Impact Strength / Toughness

Impact strength of BIOMAX® Thermal 300 modified PLA is significantly improved even at 2 wt% addition level.

Brittleness

Biomax® Thermal 300 greatly improves the cutting & trimming of PLA. While unmodified PLA exhibits breakage at the edge of the sheet, blends with 2 to 5 wt.% of Biomax® Thermal 300 show no breakage. There is also a marked improvement of "pinning". While unmodified PLA breaks at the edge of the sheet, there is no breakage once BIOMAX® Thermal 300 is added.

Extruder Torque and Processing Stability

Addition of 1-2% Biomax® Thermal 300 to PLA in the feedhopper of the extruder significantly reduces the power per output required to extrude PLA. Addition of Biomax® Thermal 300 also helps maintain the viscosity and molecular weight of PLA during processing.

Applications

Polylactic Acid (PLA) Modification

Typical Properties

Physical	Nominal Values	Test Method(s)	
Density ()	0.94 g/cm ³	ASTM D792	ISO 1183
Melt Flow Rate (190°C/2.16kg)	1200 g/10 min	ASTM D1238	ISO 1133
Thermal	Nominal Values	Test Method(s)	
Melting Point (DSC)	113°C (235°F)	ASTM D3418	ISO 3146

Processing Information

General

Maximum Processing Temperature	280°C (536°F)
General Processing Information	Handling & Storage

Biomax® Thermal 300 is supplied in polyethylene bag lined boxes or bags. The product does not require drying but the material should be handled in a way that minimizes moisture pick-up. For example reseal bags or box liners when partial bags or boxes are not being used.

Processing of blends of Biomax® Thermal 300 and PLA

Blends of Biomax® Thermal 300 and PLA can be processed in the same equipment and under the same processing conditions recommended for PLA

The melting point of Biomax® Thermal 300 is 72C (162F) so a split feed extruder hopper will be required in cases where the PLA resin is dried on line and temperature of the hot dried PLA exceeds the melting point of the modifier.

Melt Viscosity and Melt Thermal Stability

Under typical processing conditions melt viscosity of PLA melt blends with Biomax® Thermal 300 is not significantly different from that of unmodified PLA. Melt stability of PLA is improved by adding Biomax® Thermal.

Thermoforming sheet of PLA and Biomax® Thermal 300

Add 2% to 4% Biomax® Thermal 300 to modify PLA via a second feeder. Process the blend into cast sheet under conditions typical of PLA. The highest additive levels might require cooler quench drums to avoid excessive sheet crystallinity which can limit thermoformability. Pre-heat the sheet at conditions typical for PLA. The highest additive levels might require limiting the time in the heater to avoid excessive sheet crystallinity. The thermoforming equipment should use a hot mold (for developing crystallinity) followed by a cool mold (to harden the article enough for handling). The hot mold should be heated to 110-120 C and the residence time in the mold optimized according to the article design, and end-use thermal requirements. The cool mold should be set below about 40C to obtain the best cycle time. The grade of PLA will also effect the ultimate amount of crystallinity which in turn effects the mechanical strength of the semifinished article.

FDA Status Information

DuPont™ BIOMAX® Thermal 300 Resin Modifier complies with Food and Drug Administration Regulation 21 CFR 175.105 - Adhesives. This Regulation describes adhesives that may be used as components of articles intended for use in packaging, transporting, or holding food, subject to the limitations and requirements therein.

DuPont™ BIOMAX® Thermal 300 Resin Modifier may be used at up to a level of 10 percent in polylactic acid (PLA) resin for direct food contact. The PLA resin containing DuPont™ BIOMAX® Thermal 300 Resin Modifier is intended for contact with all food types under temperature conditions C through G, as described in Table 2 of 21 CFR 176.170(c). Such use may be properly said to comply fully with the Federal Food, Drug, and Cosmetic Act and all applicable food additive regulations.

Regulatory Information

For information on the compliance of Biomax® Thermal 300 with food contact regulations outside the U.S., please consult your local DuPont representative.

Safety & Handling

Refer to the MSDS for Biomax® Thermal 300.

Read and Understand the Material Safety Data Sheet (MSDS) before using this product

Regional Centres

DuPont operates in more than 70 countries. For help finding a local representative, please contact one of the following regional customer contact centers:

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