

LAPOL® HDT-P TECHNICAL DATA SHEET AND PROCESSING GUIDE

rev.160419



Introduction

Lapol® HDT-P is a thermoplastic resin that increases the heat distortion temperature and improves the crystallization rate of PLA-based resins. NatureWorks Ingeo™ Biopolymer 2000, 3000, 4000, and 6000 series all show improved heat distortion temperatures with the addition of Lapol® HDT-P.

Safety and Handling Precautions

Normal safety precautions should be followed when handling and processing molten thermoplastics and when handling Lapol® HDT-P. Consult the MSDS before processing.

Lapol® HDT-P is sensitive to processing temperature. Melt processing above the recommended guidelines (see below) may result in minor degradation. Lactide, a non-hazardous gaseous irritant, is a minor byproduct of melt processing. Normal polymer air handling systems should be in place and will handle this minor out-gassing during processing. In addition, Lapol® HDT-P/PLA compounds should be processed below their decomposition temperature,

which will occur around 250 °C (482 °F). Avoid temperatures above 220 °C (428 °F).

Resin Properties

Table 1 shows some of the physical properties of Lapol® HDT-P. Drying prior to processing is essential. The polymer is stable in the molten state, with very little to no out-gassing, provided that the drying procedures and extrusion procedures are followed. The resin is available as a white pellet.

Table 1. Physical Properties of Lapol® HDT-P

Properties	Lapol® HDT-P
Color	White to off white
Density	1.20 g/cc
Physical State	Pellet
Melting Point	110 – 125 °C 170 - 180 °C

Figure 1 shows the complex viscosity PLA, Lapol® HDT-P/PLA blends, and polypropylene in the temperature range between 130 to 210 °C. The Lapol® HDT-P blends show similar process-ability to polypropylene up to 200 °C.

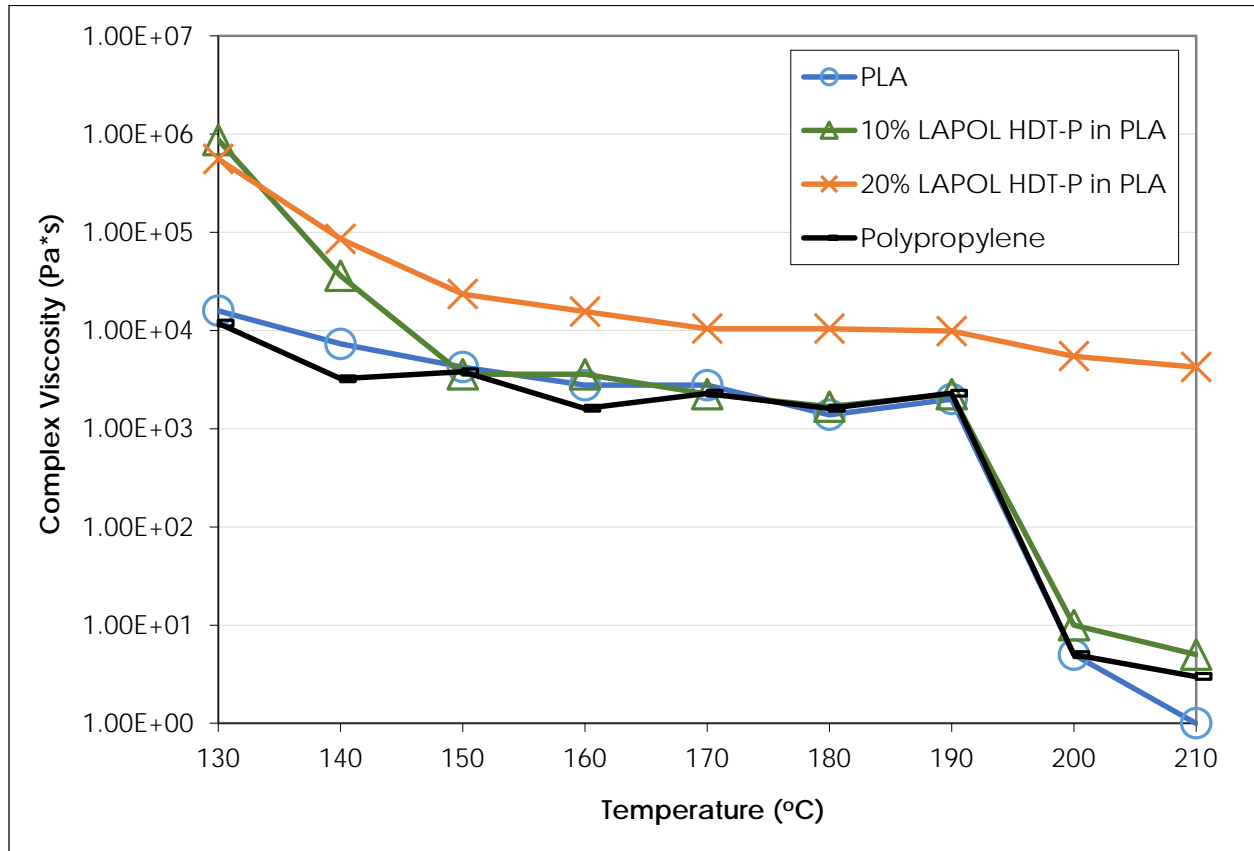


Figure 1. Viscosity of PLA, LAPOL® HDT-P Blends and Polypropylene

Drying

As with all PLA based resins, Lapol® HDT-P must be dried prior to use; it should be dried to a maximum of 400 ppm (0.040%) moisture as measured by a Karl Fischer coulometric titration method. Processes that have unusually long residence times, or result in a melt temperature greater than 190 °C, should dry PLA to less than 200 ppm

(0.020%) moisture. In-line drying is recommended for hopper mounted dryers for quick and convenient processing that ensures no moisture absorption. The standard recommended drying procedure is to use -40 °C/F dew point air for four hours at < 70 °C (158 °F).

The resin should not be exposed to atmospheric conditions after drying. Keep the package sealed until ready to use and promptly reseal any unused resin.

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Compounding

Lapol® HDT-P resin processes on conventional plastics compounding equipment with minimal modifications. The resin is stable and processes at medium speeds. Drying procedures must be followed to ensure proper processing and plasticity of the polymer. The following recommended processing temperatures may be adjusted for certain processes, but processing above 220 °C (428 °F) will likely

result in degradation and will compromise properties. Process optimization in specific equipment may require technical support from Lapol, LLC.

Note: The chart shown below is for a 20% Lapol® HDT-P and 80% NatureWorks 3001D PLA compound run on a twin-screw extruder. Temperatures are provided as a guideline and may need to be adjusted according to the specific equipment and Lapol® HDT-P loading percentage.

Table 2. Compounding Parameters of Lapol® HDT-P

Processing Parameters	Settings
Feed Throat	145° - 155 °C / 293° - 311 °F
Feed Temperature	155° - 165° C / 311° - 329 °F
Melt Temperature	160° - 195° C / 320° - 383 °F
Die	165° - 180° C / 329° - 356 °F
Screw Speed	30 - 150 rpm
Back Pressure	No higher than 700 psi

Injection Molding

Lapol® HDT-P resin processes on conventional injection molding equipment with minimal modifications. The resin is stable and processes at medium speeds. Drying procedures must be followed to ensure proper processing and plasticity of the polymer. The following recommended processing temperatures may be adjusted

for certain processes, but processing above 220 °C (428 °F) will likely result in degradation and will compromise properties. Process optimization in specific equipment may require technical support from Lapol, LLC.

Note: It is important not to allow the blends to remain in the barrel of the for extended periods of time. The chart shown below is

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for a 20% Lapol® HDT-P and 80% NatureWorks 3001D PLA dry blend; processing parameters and results may differ with pre-compounded Lapol® HDT-P

and PLA. Temperatures are provided as a guideline and may need to be adjusted according to the specific equipment and Lapol® HDT-P loading percentage.

Table 3. Injection Molding Parameters of Lapol® HDT-P

Processing Parameters	Settings
Melt Temperature	170°C - 180 °C / 338°F - 356 °F
Mold Temperature	50°C – 110 °C / 122 °F – 230°F
Mold Residence Time	5-30 seconds
Back Pressure	No higher than 400 psi
Screw Speed	Moderate

Thermoforming

Lapol® HDT-P resin processes on conventional thermoforming equipment with minimal modifications. The resin is stable and processes at medium speeds. Drying procedures must be followed to ensure proper processing and plasticity of the polymer. The following recommended processing temperatures may be adjusted for certain processes, but processing above 220 °C (428 °F) will likely result in degradation and will compromise properties. Process optimization in specific equipment may require technical support from Lapol, LLC.

Note: It is important not to allow the blends to remain in the extruder for extended periods of time. When processing Lapol® HDT the sheet temperature should be 80 - 120 °C, otherwise, follow the guidelines for processing INGENO™ PLA polymers. Processing parameters and results may differ with pre-compounded Lapol® HDT-P and PLA prior to thermoforming. Temperatures are provided as a guideline and may need to be adjusted according to the specific equipment and Lapol® HDT-P loading percentage.