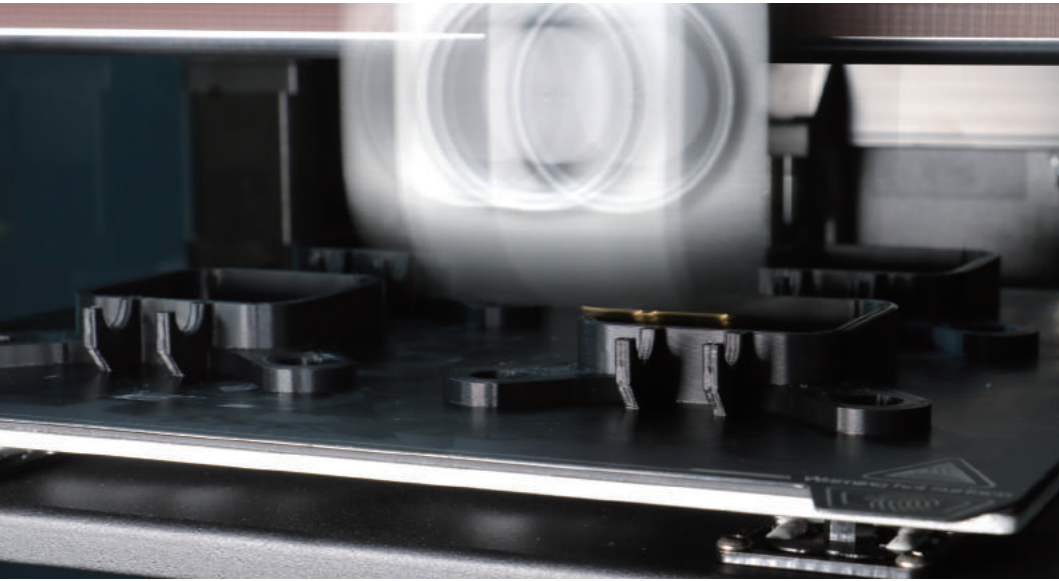
PolySonic™ PLA



Professional

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www.polymaker.com

INDEX

1.0 Printing with PolySonic™ PLA 4

1.1 Physical Properties 5

1.2 Thermal Properties 5

1.3 Mechanical Properties 6

1.4 High-Speed Performance 6

1.8 Recommended Print Profile 11

2.0 Material development 12

3.0 Polymaker technologies 13

4.0 Contact us 14

PolySonic™ PLA

Introduction

PolySonic™ PLA is a revolutionary high-speed 3D printing filament, the ultimate game-changer in additive manufacturing. With its lightning-fast extrusion rate, cutting-edge precision, and exceptional layer adhesion you can ramp up the speed of your 3D printer and witness new levels of productivity. Accelerate your workflow without compromising on strength or quality.

Key Features

High-Speed

Consistent Extrusion

Easy to Print

Physical Properties

Property	Testing Method	Typical Value
Diameter		97% is within +/- 0.02
		99% is within +/- 0.03
		99.9% is within +/- 0.04
Weight		1000g ± 30g
Density	ISO1183, GB/T1033	1.23 g/cm^3 at 21.5°C
Melt index	210°C, 2.16 kg	15.4 g/10min
Saturated Water Absorption		0.39%

Thermal Properties

Property	Testing Method	Typical Value
Glass transition temperature	DSC, 10°C/min	57 °C
Melting temperature	DSC, 10°C/min	164 °C
Crystallization temperature	DSC, 10°C/min	96 °C
Decomposition temperature	TGA, 20°C/min	370 °C
Vicat softening temperature	ISO 306, GB/T 1633	61 °C
Heat deflection temperature	ISO 75 1.8MPa	52 °C
Heat deflection temperature	ISO 75 0.45MPa	53 °C

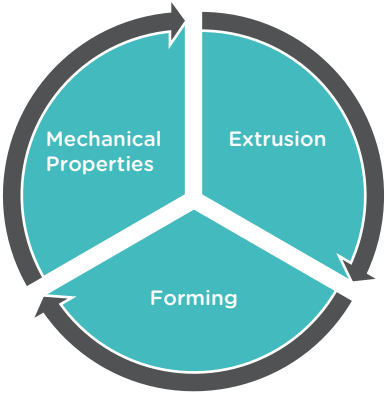
Mechanical Properties

Property	Testing Method	Typical Value (classic speed)	Typical Value (high speed)
Young's modulus (X-Y)	ISO 527, GB/T 1040	2878.3 ± 74.3 MPa	2649.7 ± 78.3 MPa
Young's modulus (Z)		2689.8 ± 92.0 MPa	2210.4 ± 79.4 MPa
Tensile strength (X-Y)	ISO 527, GB/T 1040	46.0 ± 0.5 MPa	43.9 ± 0.4 MPa
Tensile strength (Z)		37.3 ± 0.7 MPa	30.4 ± 0.4 MPa
Elongation at break (X-Y)	ISO 527, GB/T 1040	21.5 ± 5.02 %	15.1 ± 3.9 %
Elongation at break (Z)		4.2 ± 2.0 %	3.3 ± 0.5 %
Bending modulus (X-Y)	ISO 178, GB/T 9341	2868.2 ± 78.4 MPa	2797.9 ± 40.7 MPa
Bending strength (X-Y)	ISO 178, GB/T 9341	76.5 ± 0.9 MPa	71.4 ± 0.6 MPa
Charpy impact strength (X-Y)	ISO 179, GB/T 1043	6.1 ± 0.6 kJ/m2	5.0 ± 0.5 kJ/m2

Note:
Based on 0.4 mm nozzle and 0.2mm layer thickness. Classic printing speed = 46.7mm/s, printing temperature = 210°C. High printing speed = 300mm/s, printing temperature = 230°C

High-Speed Performance

To validate the concept of high-speed printing, we have established three criteria that delineate how a material can perform effectively under high-speed conditions (specifically, at speeds of 300mm/s with a 0.4mm nozzle and 0.2mm layer height).



Extrusion

In terms of high-speed extrusion, PolySonic™ PLA demonstrates significant improvements compared to the general PolyLite™ PLA, by exhibiting a wider extrusion window and higher flow rates when printing.
As illustrated in Figure 1, the data unveils a remarkable attribute of PolySonic™ PLA – it maintains an extrusion efficiency exceeding 95% even at a flow rate surpassing 24mm^3/s (equivalent to a swift 300mm/s printing speed with a 0.4mm nozzle and 0.2mm layer thickness). In contrast, conventional PLA, such as PolyLite™ PLA grapples with under-extrusion challenges at such speeds.

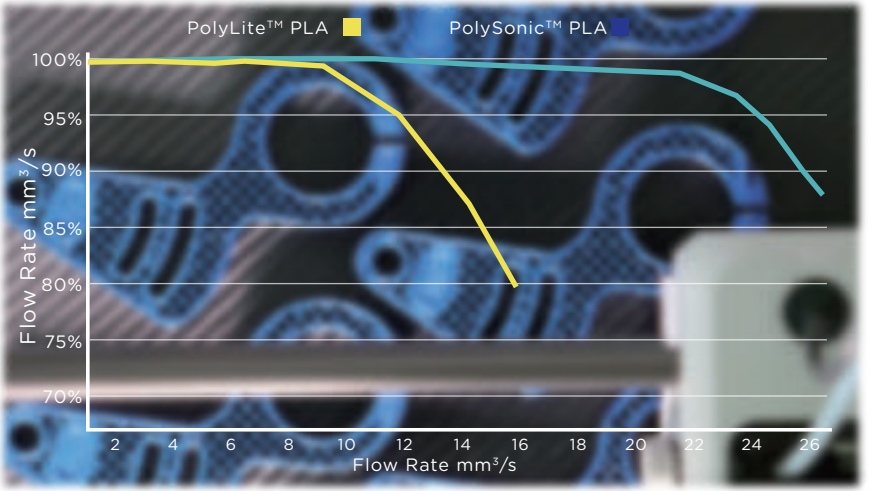


Fig.1 Comparison of extrusion efficiency between PolyLite™ PLA and PolySonic™ PLA at 190 °C (The reference extrusion testing is performed on a customized extrusion platform equipped with E3D volcano hotend and 0.4mm nozzle with Hemera XS extruder)

Figure 2 reinforces this point by showcasing the clear advantage of PolySonic™ PLA across varying extrusion temperatures. Irrespective of the temperature, the maximum flow rate achieved by PolySonic™ PLA consistently surpasses that of PolyLite™ PLA. In essence, PolySonic™ PLA emerges as the ultimate solution for high-speed printing, harnessing a superior extrusion capability that surpasses the capabilities of traditional PLA filaments.

Experience the future of rapid 3D printing with PolySonic™ PLA, where speed meets precision like never before.

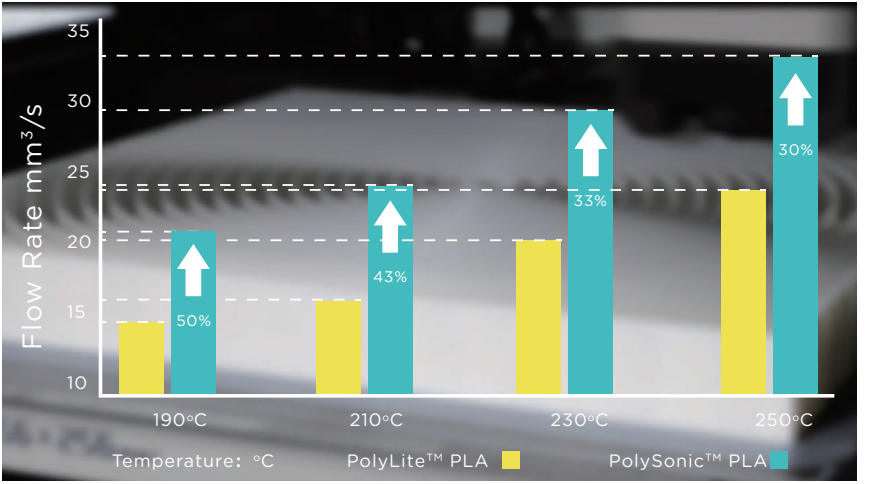


Fig.2 Comparison of the max flow rate of PolyLite™ PLA and PolySonic™ PLA with incremental temperatures (The reference extrusion testing is performed on a customized extrusion platform equipped E3D volcano hotend and 0.4mm nozzle with Hemera XS extruder).

Forming

With PolySonic™ PLA you can experience an excellent and fast print process without sacrificing the printing quality, in the meantime, it can help you to save over 30% print time, to dramatically increase your productivity, and achieve your goals faster.

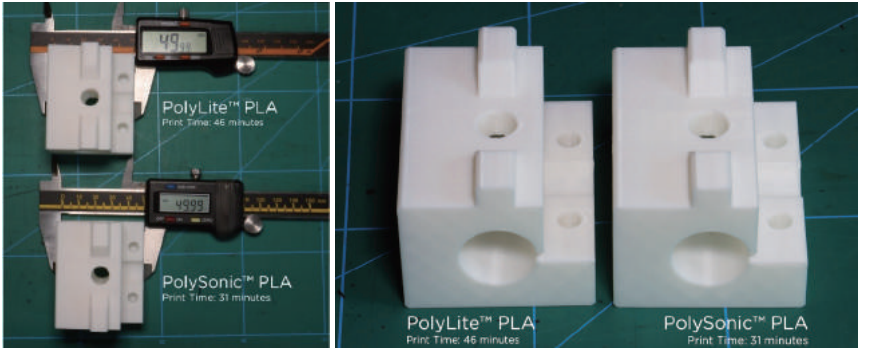


Fig.3 Comparison of the printed part by PolySonic™ PLA and PolyLite™ PLA

Mechanical Properties

PolySonic™ PLA exhibits the inherent strength and modulus of PLA, and remarkably, it maintains its mechanical integrity even at high printing speeds, retaining approximately 90% of its strength when printed at standard speeds (refer to Fig.4). As a result, PolySonic™ PLA empowers you to create parts that are not only fast but also functional.

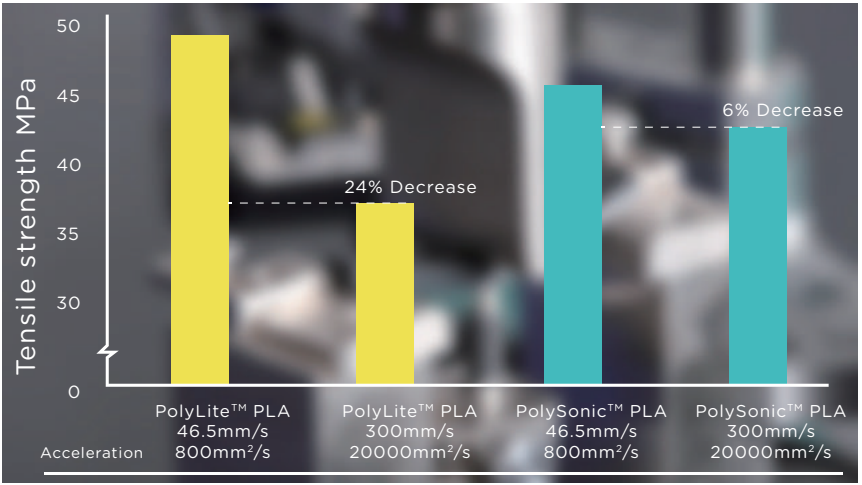


Fig.4 Comparison of tensile strength of PolySonic™ PLA and PolyLite™ PLA at high speed and classic speeds.

Recommended Print Profile

At Polymaker, prioritizing the user experience of our materials remains paramount. To enhance the convenience of using our PolySonic™ PLA, we have meticulously developed printer profiles tailored to compatible print ers. These printing profiles aim to provide you with an optimized printing experience. If you're interested in utilizing these tailored profiles, please visit the PolySonic™ product page on www.polymaker.com

Material Development

If your application requires a specific material that is not yet available in the market, consider our custom development service. With our talented material scientists and application engineers, we are ready to develop the necessary materials to enable your unique application.

Material development

-Twin-screw compounding
-Single-screw extrusion
-Torque rheometry
-Wet chemistry
-Other polymer processing equipment

Testing and characterization

-Thermal characterization (DSC, softening point)
-Mechanical testing (tensile, 3-point bending)
-Optical microscopy
-Capillary rheometry
-FTIR-ATR

3D Printing

-3D printing
-Post-processing
-Application development

Our state-of-the art R&D facilities allow us to engineer materials at different levels and fully optimize them for 3D printing. Our goal is to deliver materials with the right combination of properties/functions, processability and form to suit your needs!

Processability technologies

Printing thechnologies
Post-processing
Other

Properties & functions

Mechanical
Thermal
Electrical
Other

Form

Pellet
Filament
Powder
Other

Technologies

JAM-FREE™

Regular PLA

With Jam-Free™

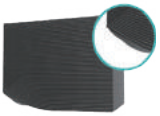
ASH-FREE™

Without Ash-Free™
Ash content: 0.5%

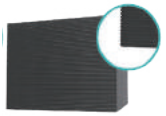
With Ash-Free™
Ash content: 0.003%

WARP-FREE™

Regular Nylon



With Warp-Free™



STABILIZED FOAMING™

Wood

Stabilized Foaming™

LAYER-FREE™

Rough surface

With Layer-Free™

FIBER ADHESION™

NANO-REINFORCEMENT

Contact us

For any inquiries please contact:

inquiry@polymaker.com

For technical support please contact:

support@polymaker.com

The information provided in this document is intended to serve as basic guidelines on how particular product can be used. Users can adjust the printing conditions based on their needs and actual situations. It is normal for the product to be used outside of the recommended ranges of conditions. Each user is responsible for determining the safety, lawfulness, technical suitability, and disposal/recycling practices of Polymaker materials for the intended application. Polymaker makes no warranty of any kind, unless announced separately, to the fitness for any particular use or application. Polymaker shall not be made liable for any damage, injury or loss induced from the use of Polymaker materials in any particular application

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