

# The Secrets Unlocked- The Basics of PLA Filaments in 3D Printing for Beginners.

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In this article, we will cover seven questions you may have regarding PLA Filaments. We will provide a little history of PLA filaments and how they became one of the market's most popular and user-field filaments.

*A set of PLA Filaments together next to a finished product created by PLA - Canva*



- ***Polylactic acid (PLA)*** stands as one of the original plastics, with its initial creation dating back to 1938, although it wasn't introduced to the commercial market until much later. It emerged as an environmentally friendly, biodegradable alternative to PET in the 1980s. The fundamental PLA filament consists of a lengthy chain of lactic acid blended with nucleating agents and plasticizers, which is then extruded into a fiber. This foundational material can be elevated with various enhancements, including carbon fiber, wood fibers, metal particles, multiple colors, graphene flakes, copolymer additives, and modifiers for melt viscosity. More straightforward filaments are denoted as PLA, while those featuring a more intricate additive blend are labeled PLA+.
- Now, let's dive into our comprehensive guide on PLA filament, where you'll discover the fascinating world it opens up and how it can enhance your 3D printing experience.

## ***Question 1: The Purpose of PLA Filament in 3D Printing?***

- ***Polylactic acid (PLA)*** stands as one of the original plastics, with its initial creation dating back to 1938, although it wasn't introduced to the commercial market until much later. It emerged as an environmentally friendly, biodegradable alternative to PET in the 1980s. Its ability to deliver appeal when creating any object and its user-friendly capabilities in machine settings make it suitable for beginners like me.

- PLA is a common filament material in FDM printing, also known as *Fused Deposition Modeling*. FDM is a 3D printing technology that creates parts from the plastic filament by melting and depositing them in layers.
- PLA has become a number one choice in 3D printing due to its advantages over other standard FDM filaments. These properties make it a better option for a portion of small FDM prints. The key factors that build on to its popularity include PLA's capacity for intra-layer bonding, another name for Fused Deposition Modeling, and wide temperature tolerance. Additionally, PLA's ability to withstand various extruder temperatures makes it compatible with many 3D printers. Its ability to perform well in the more astounding table and build environments further extends its usability, even for those with limited experience in 3D printing.

## ***Question 2: What is PLA Filament mainly Composed of?***

- PLA filament is a polymer derived from the fermentation of plant-based materials such as sugar cane, taro, and cornstarch. PLA can be separated into two main groups:
- **PLA:** This category primarily consists of pure polymer, although it might include minimal additives to alter specific characteristics, including intramolecular flexibility, melt viscosity, and color or visual attributes.

- **PLA+:** In contrast, PLA+ will likely contain significant quantities of diverse additives. These additives encompass carbon fiber, which enhances model stability, stiffness, and ultimate tensile strength (UTS); wood fiber for aesthetic effects; graphene for increased stiffness and UTS; and metal particles to enhance its visual appeal.

### ***Question 3: What is the Best Print Speed for PLA Filament?***

- The optimal PLA print speed is within the range of **40 to 60 mm/s**. However, under suitable machine conditions, PLA can yield satisfactory results even at speeds reaching up to 100 mm/s, but it is not recommended if you want to have a clean finish. The choice of print speed is specific mainly on the properties of the 3D printer you own and the desired level of cosmetic quality for the final product.

### ***Question 4: What is the Optimal Melting Temperature for PLA Filaments?***

- The melting temperature range for PLA filament spans from **170-180 °C** - to **200-220 °C**. It depends on the type of PLA filament that you buy. Performing a test print before printing the product is always recommended to ensure the correct temperature and settings.

- Some experts suggest commencing at approximately **200 °C** and adjusting up or down as necessary. It does not require a heated bed; however, if your printer is equipped with one, it is an excellent choice to set it between **20 and 60 °C**. Although pushing it to **70 °C** might be possible, it is best to avoid higher temperatures to avoid damaging the product.
- Keeping the cooling fans active when working with PLA is essential, as proper cooling yields superior results. Overall, PLA is a user-friendly filament requiring minimal effort for successful printing.
- **Nozzle temperature:** 180–220 °C
- **Bed temperature:** 20-60 °C

### ***Question 5: Is a Heated Printed Bed Required When Printing with PLA Filaments?***

- As stated in the previous question, using a heated printing bed is unnecessary when working with PLA. A heated bed primarily provides one benefit: it makes removing the finished part easier due to the relative cooling of the model material, breaking its bond with the bed. However, because PLA exhibits only a weak adhesion to the bed material, this advantage is relatively minor and does not deter the use of PLA on primary, unheated bed machines.

## ***Question 6: Regarding PLA Filament, What is a Good Wall Thickness?***

- An optimal wall thickness for 3D printing with PLA typically falls within the 1.2 to 2.2 mm range to achieve maximum integrity. However, if the primary purpose is solely cosmetic, a thickness as low as 0.8 mm can often be adequate. Selecting the ideal wall thickness depends on the specific function it serves within the model's structure, and this decision requires a degree of expertise to make the right choice.

## ***Question 7: When it comes to PLA Filaments, what are the Limitations?***

- PLA is ideal for crafting cosmetic models with a limited or brief product lifespan. These models typically do not endure significant stress, and their configurational accuracy can be considered acceptable within moderate limits. However, PLA must be better suited for testing prototypes, parts requiring assembly, or components designed to serve as bearings or withstand large amounts of motion. Moreover, PLA is unsuitable for outdoor applications, wet environments, chemical exposure, or situations that reveal its limited durability.
- Despite often being promoted as an environmentally friendly option, PLA is not the most suitable choice for eco-friendly disposal. It necessitates separate sorting and is biodegradable under specific commercial composting conditions.

