

Part 3 - Filament types

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There are many different filament types available on the market.

For most hobbyists and the majority of typical use cases, we mainly use **PLA**, **PETG**, or **TPU**. These base materials can be blended with various additives to provide special properties such as unique colors, different hardness levels, glow-in-the-dark effects, increased durability, or enhanced mechanical strength.

When we have more advanced or specific requirements, we may turn to materials like **ABS**, **ASA**, **PC**, **PA6**, or **PAHT**, each offering its own performance advantages.

It's always a good idea to visit the websites of reputable filament manufacturers and read their recommendations. Here is a helpful source:

<https://bambulab.com/en/filament/collections>

PLA - Polylactid

- Polylactides (PLA) belong to the polyesters
- Used to make plastic that is obtained from regenerative sources (e.g.: corn starch).
- PLA a "biocompatible" raw material.
- 3D printing filament is often not pure PLA, but a so-called PLA blend, whose basic structure is enriched with additives to obtain certain desired properties.
- No enclosure needed, as PLA does not release harmful gases when it is heated up

- Low melting point, Printing temperature: 175° - 220
- Low deformation, Fast printing speed, Easy to print, Suitable for small and large objects, low warpage, flame retardant
- Dimensional stability is up to a maximum of 65 degrees Celsius
- Weather resistance is quite high
- Somewhat brittle
- Can be combined with other material such as hemp

- Recycling and compostable rate is low, because it is grouped with "other plastics" and practically gets mixed with other plastics.
- 100% biodegradable does not mean, that it happens naturally
- It needs to be heated up to a very high temperature at a special composting facility to break down, once it has broken down, bacteria can consume the PLA resulting in little byproducts.
- If your city has a proper composting facility and sorting facility, it can be properly composed. But often it is sent to "normal" recycling facilities and then it will be sent to landfill or will be burned.
- Debate, whether corn should not be better produced for consumption and not for making plastic

PLA Variations

- **PLA+ (PLA Plus)** – Stronger and less brittle than standard PLA.
- **Silk PLA** – Shiny, silky finish; great for decorative prints.
- **Matte PLA** – Low-gloss surface that hides layer lines well.
- **Wood-filled PLA** – Contains wood fibers; looks and smells like wood.
- **Metal-filled PLA** – Mixed with metal powders (bronze, copper, steel) for weight and metallic appearance.
- **Carbon-fiber PLA** – Stiffer and lighter, with a textured finish.
- **Glow-in-the-dark PLA** – Contains phosphorescent particles.

- **Flexible PLA (PLA-Flex)** – Slightly bendable but still easier to print than TPU.
- **Transparent / Translucent PLA** – Clear or semi-clear for light-diffusing prints.
- **High-temperature PLA (PLA-HT / PLA Pro)** – Higher heat resistance after annealing.

PETG

- PET (Polyethylene Terephthalate) and PETG (Polyethylene Terephthalate Glycol) are two variations of the same polymer, with some key differences in terms of their properties and applications:
- PET is a clear, transparent, colorless, and rigid plastic
- PET more challenging to 3D print, it needs a higher melting temperature and adhesion can be an issue.
- PETG contains the addition of glycol and makes PETG more flexible and less brittle compared to PET.
- PETG is naturally transparent but may have a slightly milky appearance. It is available in various colors
- PETG is more popular for 3D printing due to its lower melting temperature and better adhesion properties.
- Adheres well to a variety of surfaces, including a non-heated print bed.
- Especially suitable for mechanical parts and both indoor & outdoor use.
- Nozzle printing temperature is usually around 220 - 260°C
- Print Bed Temperature is usually 60°C - 90°C
- No enclosure needed, as PETG does not release harmful gases when it is heated up

PETG Variations

- **Standard PETG** – Tough, slightly flexible, easy to print.
- **PETG+ / PETG Pro** – Improved toughness, reduced stringing.
- **Matte PETG** – Low-gloss finish that reduces visible layer lines.
- **Carbon-fiber PETG** – Stiffer, lighter, and more heat-resistant.
- **Glass-filled PETG** – Very rigid and strong; higher wear resistance.
- **Glycol-modified PET (PETG)** – The common translucent variety; good clarity.
- **Transparent / Clear PETG** – High clarity for light covers and displays.
- **Chemical-resistant PETG** – Formulated for better solvent resistance.
- **Food-contact-grade PETG** – Made for applications where cleanliness matters (still needs proper handling).

TPU / TPE

- TPE (Thermoplastic Elastomer) combines the properties of plastic and rubber
- TPU (Thermoplastic Polyurethane) is a subset of TPE and has often a rubber-like finish
- TPU and TPE are flexible 3D printing materials
- They come in different range of hardness/softness and flexibility
- Nozzle printing temperature is usually around 215-255°C
- Print Bed Temperature is usually between 0 - 60°C

TPU Variations

- **TPU 95A** – The most common; flexible but still easy to print.
- **TPU 98A / 100A** – Firmer TPUs for functional parts needing strength.
- **TPU 85A** – Softer, more rubber-like; harder to print.
- **Ultra-soft TPU (60A–70A)** – Very soft, gel-like; specialized printing setups required.
- **Conductive TPU** – Contains carbon additives for mild conductivity (e.g., sensors).
- **Transparent / Translucent TPU** – Clearer variants for grips or light-diffusing parts.
- **Abrasion-resistant TPU** – Formulated for wear-heavy applications (wheels, belts).
- **Food-contact-safe TPU** – Used in some compliant applications (again: requires correct post-processing).
- **Color-changing TPU** – Thermochromic or UV-reactive, changes color with heat or sunlight.

Some general advice

PLA, PETG, and TPU typically fall within a similar price range—usually **10€ to 30€ per kilogram**. Prices vary depending on the brand, quality, and whether you buy a single spool or take advantage of bulk discounts.

In general, **PLA prints faster** and with fewer difficulties compared to PETG and TPU.

For beginner training, it is recommended to start with **PLA**.

Using PETG offers no real advantages in a training context, and **TPU** often requires different design considerations due to its flexibility. This makes TPU less suitable for absolute beginners.

Where to buy filament?

- amazon
- online stores of 3D printing companies e.g.: <https://eu.store.bambulab.com/>
- online stores distributing 3d printing equipment and filament e.g.: <https://www.3djake.com/>
- producers of 3d printing filaments like <https://spectrumfilaments.com/en/> or check here <https://3dprinted.fashion/filament>