

3D Printing Filaments

3D Printing Filaments

- ▶ 3D filaments is basically the ink of 3D printers.
- ▶ They are the thermoplastics feed stock of FDM printer that are used to make the objects.
- ▶ There are many different types of filament material.
- ▶ Most common are:
 - ▶ PLA (Poly Lactic Acid)
 - ▶ ABS (Acrylonitrile Butadiene Styrene)
 - ▶ PETG (Polyethylene Terephthalate)
 - ▶ Nylon
 - ▶ Flexible filament
 - ▶ Polycarbonate (PC)

Poly Lactic Acid (PLA)

PLA is easily the most popular 3D printer filament type.

It is the most easiest to print with.

Has a lower printing temperature and it doesn't warp as easily.

It doesn't require a heating bed.

It does not give of any odour while printing.

PLA is generally biodegradable and hence are considered environment friendly.

3D Printer Filament Properties: PLA



STRENGTH:
HIGH |
FLEXIBILITY:
LOW |
DURABILITY:
MEDIUM



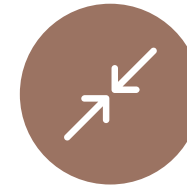
**DIFFICULTY
TO USE:** LOW



**PRINT
TEMPERATUR
E:** 180°C –
230°C



**PRINT BED
TEMPERATUR
E:** 20°C – 60°C
(BUT NOT
NEEDED)



**SHRINKAGE/W
ARPING:**
MINIMAL



SOLUBLE: NO



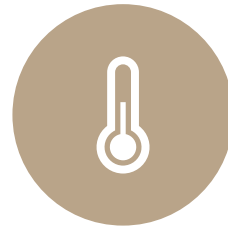
FOOD SAFETY:
REFER TO
MANUFACTUR
ER
GUIDELINES.



PLA IS BRITTLE,
AVOID USING IT
WHEN MAKING
ITEMS THAT
MIGHT BE BENT,
TWISTED, OR
DROPPED
REPEATEDLY.



YOU SHOULD
ALSO AVOID
USING IT WITH
ITEMS WHICH
NEED TO
WITHSTAND
HIGHER
TEMPERATURES.



PLA TENDS TO
DEFORM AROUND
TEMPERATURES
OF 60°C OR
HIGHER.



THERE ARE NEW
TYPES OF PLA
FILAMENT THAT
IS BEING
DEVELOPED
WITH THE
INTENTION OF
IMPROVING THE
PROPERTIES OF
PLA.



PLA CAN BE
ANNEALED TO
IMPROVE THE
PROPERTIES BUT
ANNEALING THE
PRINTED OBJECT
CAN LEAD TO
DRASTIC CHANGE
IN DIMENSIONS
AND CAN RENDER
THE PRINTED
OBJECT USELESS.

Acrylonitrile Butadiene Styrene (ABS)

Second most popular 3D printer filament,

ABS is moderately superior to PLA, in terms of strength, durability and other properties.

More difficult to print with compared to PLA.

ABS is found in many manufactured household and consumer goods, motorcycle and safety helmets.

3D Printer Filament Properties: ABS



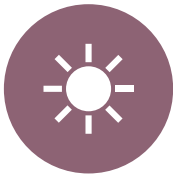
Strength: High |
Flexibility: Medium
| Durability: High



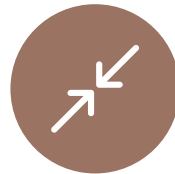
Difficulty to use:
Medium



Print temperature:
210°C – 250°C



Print bed
temperature: 80°C
– 110°C



Shrinkage/warping:
Considerable



Soluble: In esters,
ketones, and
acetone



Food safety: Not
food safe

PETG

Polyethylene terephthalate (PET) is the most commonly used plastic in the world.

It is polymer used in water bottles and food containers.

“Raw” PET is rarely used in 3D printing, its variant PETG is a popular 3D printer filament.

The ‘G’ in PETG stands for “glycol-modified”.

Filament less brittle and easier to use than its base form.

PETG is often considered a good middle ground between ABS and PLA.

3D Printer Filament Properties: PETG



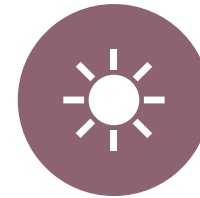
STRENGTH:
HIGH |
FLEXIBILITY:
MEDIUM |
DURABILITY:
HIGH



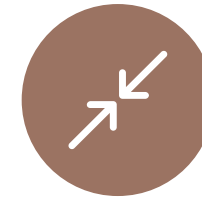
**DIFFICULTY TO
USE:** LOW



**PRINT
TEMPERATURE:**
220°C – 250°C



**PRINT BED
TEMPERATURE:**
50°C – 75°C



**SHRINKAGE/WA
RPING:**
MINIMAL



SOLUBLE: NO



FOOD SAFETY:
REFER TO
MANUFACTURE
R GUIDELINES

Nylon

Nylon is a popular family of synthetic polymers used in many industrial applications.

One of the strongest, flexible and durable 3D filament material.

Unique characteristic of this 3D printer filament is that you can dye it, either before or after the printing process.

The negative side to this is that nylon, like PETG and ABS, is hygroscopic, meaning it absorbs moisture from the air that can cause print failures.

Should be stored in a dry place.

Used to create tools, functional prototypes, or mechanical parts (like hinges, buckles, or gears).

3D Printer Filament Properties: NYLON



STRENGTH:
HIGH |
FLEXIBILITY:
HIGH |
DURABILITY:
HIGH



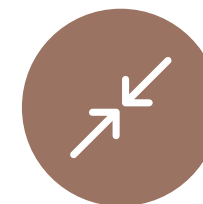
**DIFFICULTY TO
USE:** MEDIUM



**PRINT
TEMPERATURE:**
240°C – 260°C



**PRINT BED
TEMPERATURE:**
70°C – 100°C



**SHRINKAGE/WA
RPING:**
CONSIDERABLE



SOLUBLE: NO



FOOD SAFETY:
REFER TO
MANUFACTURE
R GUIDELINES

Flexible Filament

Thermoplastic elastomers (TPE) are essentially plastics with rubber-like qualities making them extremely flexible and durable.

TPE is a broad class of copolymers.

Thermoplastic polyurethane (TPU) is a particular variety of TPE.

Compared to generic TPE, TPU is slightly more rigid – making it easier to print.

Also more durable and can better retain its elasticity in the cold.

Thermoplastic copolyester (TPC) is another variety of TPE.

Main advantage is its higher resistance to chemical and UV exposure, as well to heat (up to 150°C).

3D Printer Filament Properties: TPE, TPU, TPC (FLEXIBLE)



Strength: Medium |
Flexibility: Very
High | Durability:
Very High



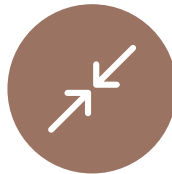
Difficulty to use:
Medium (TPE, TPC);
Low(TPU)



Print temperature:
210°C – 230°C



Print bed
temperature: 60°-70°
C (but not needed)



Shrinkage/warping:
Minimal



Soluble: No



Food safety: Not food
safe

PolyCarbonate (PC)

Strongest, most durable material in this list with excellent heat and impact resistance.

PC is moderately flexible allowing it to bend until eventually it deforms.

PC 3D filaments are hygroscopic and should be stored in a dry place.

PC is an ideal 3D printer filament for parts that need to retain their strength, toughness, and shape in high-temperature environments.

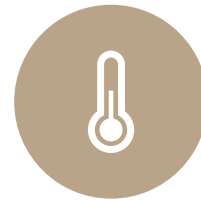
3D Printer Filament Properties: PC



STRENGTH: VERY HIGH |
FLEXIBILITY: MEDIUM |
DURABILITY: VERY HIGH



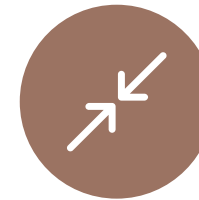
DIFFICULTY TO USE: MEDIUM



PRINT TEMPERATURE:
270°C – 310°C



PRINT BED TEMPERATURE:
90°C – 110°C



SHRINKAGE/WARPING:
CONSIDERABLE



SOLUBLE: NO



FOOD SAFETY:
NOT FOOD SAFE

- More will be updated soon