

FDM MATERIAL

POCKET FILES

A **UNICORN WAY** to understand material application, pros and cons, printing settings, tips and tricks when selecting material

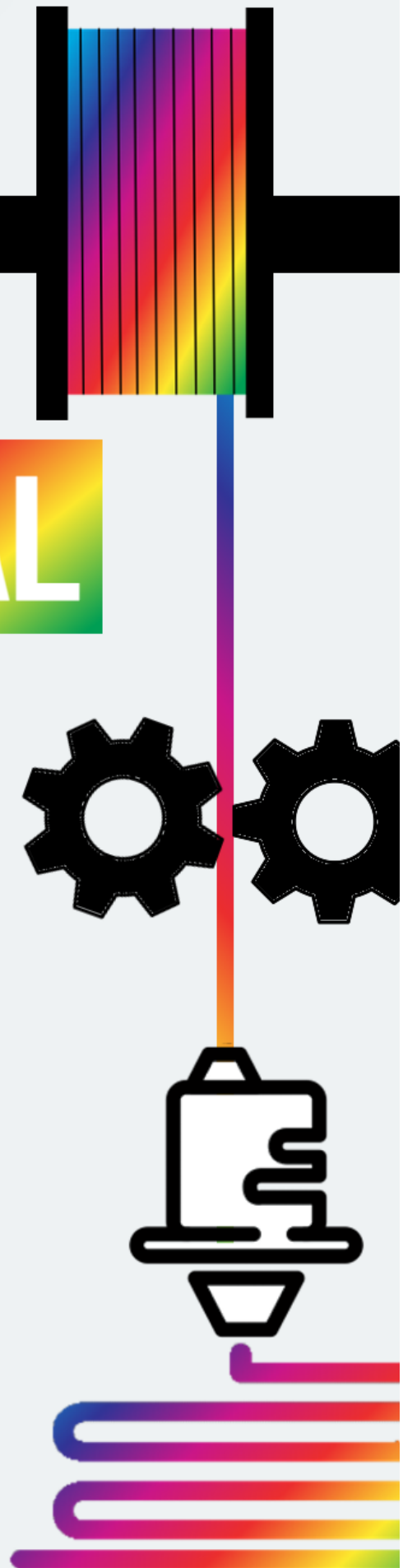


Table of Contents

Foreword	2
PLA	3
ABS	5
PETG	7
TPU	9
HIPS	11
ASA	13
PA / Nylon	15
PC	17
PP	19
PMMA	21
POM	23
PVA	24
PVB	26
PCL	27
PBT	28
PCTG	30
PPS	32
PEI	34
PEEK	36

Foreword

This pocket file is dedicated for YOU as a 3d printing user to RECOGNIZE different kinds of material in the market, to help you in choosing the best match material according to your 3d printing goal.

Hi, I'm Wilder Ong from Fabbxible. 3D Printing Technology is now getting more access by newcomers. Unfortunately, too many 3d printing users are not familiar with the material. This is because there are diverse materials in the market. Each material has their own pros and cons. Your goal is to choose the most optimized material to suit your printing goal and match your printer capability.

This got me the inspiration to make this important and useful pocket file where you can always refer to this cheat sheet whenever working for a new project. Since I captured different types of materials in my past projects, I constantly need to remind myself of the material that I used.

So, I'm glad that after drawing up my materials, I can share this with my dear friend 3D printing. If you feel like me, after using this pocket file, you will never misplace the material again and become more sure in selecting materials for your 3d printing project.

This file will be getting more updates. It will be getting new features, new materials added. I suggest you come back to download again when the new version comes out.

- Wilder Ong

PLA

(Polylactic Acid)

Overview

PLA is the MOST Common use material in 3d printing. PLA is derived from corn starch which is biodegradable and environmentally friendly. PLA is the easiest material and suitable for newbies.

Strength

- Fume less smell
- High hardness
- Office and classroom friendly
- Food safe (with smooth surface)
- Dimension stable with minimum shrinkage
- Available in variable solid and transparent color

Weakness

- Brittle
- Most fatigue material over time under stress
- Easy get clog: heat creep on All Metal Hotend or hotend with low airflow heatsink fan

- Take longer time to solidify, therefore require turn on part cooling fan or cool environment
- Not suitable for high speed printing
- Harder to sanding and polishing

Sample Print



School Teaching Skull Model



Raspberry Pi Housing

Application

- Use early-stage prototyping
- Quick jig and fixtures
- Indoor/ interior use
- Make light display like lithophane
- Teacher demo 3d printing in classroom

- Enclosure for Arduino/
Raspberry Pi project
- Use for toy
- Lost PLA Casting (melt PLA to
cast in metal)
- Food container

Tips

- Don't use for part inside the car
- Don't use for part under
constant stress e.g. from
spring, rubber band
- Make sure print surface is
completely smooth when use it
as food container, spoon, etc

Print Setting

- Hotend temperature:
190~210°C
- Heated bed temperature:
30~60°C
- Part cooling fan: 100%
- Bed surface: Glass bed, PEI,
PC
- Adhesive helper: Glue stick,
hairspray
- Print with open frame printer
- Environment: Under good
airflow, fan or air-conditioning

Other PLA Variant

- [PLA Transparent](#)
- [PLA Fluorescent](#)
- [PLA Max](#)
- [PLA Marble](#)

- [PLA Rainbow](#)
- [PLA Matte](#)
- [PLA Glitter](#)
- [PLA Galaxy](#)
- [PLA Silk](#)
- [PLA Wizard Voodoo](#)
- [PLA Glow in the Dark](#)
- [PLA Fiber Glass](#)
- [PLA Wood Filled](#)
- [PLA Metal Filled](#)
- [PLA Silk Rainbow](#)
- [PLA Carbon Fiber](#)
- [PLA ESD Antistatic](#)
- [PLA-LW](#)
- [HT PLA](#)



PLA Marble: Building



PLA Wood: Moveable Toy

ABS

(Acrylonitrile Butadiene Styrene)

Overview

ABS is the first material invented to be used in FDM 3d printing. ABS still remains its popularity to become the most recommended material for application in contact with heat due to higher heat resistance properties.

Strength 🍏

- Durable
- Good strength
- Impact resistant
- Can be smooth by Acetone vapour
- Heat resistant up to 100°C
- Ductile
- Easy sanding and polishing
- Long lasting
- Machineable
- Print faster in high speed printer
- Print more detail, suitable for miniature
- Available in variable solid and transparent color

Weakness 🙅

- Release strong and toxic Styrene fumes
- Required hot environment to print
- Warping while printing under air flow and cold environment
- Not food safe
- Weaker Z interlayer bonding
- High shrinkage rate
- Wear out hotend internal PTFE tube over time

Sample Print 📄



Rocket Toy (Acetone Vapour Smoothed)



Ventilation Housing

Application

- Use as part in touch with heat
- Can be use outdoor and inside the car
- Mechanical part that move in high speed
- Building miniature and figurine
- Use for end use part
- Part for car, motorcycle and bicycle

Tips

- Don't print under closed room especially where same room kid is sleeping
- Wear mask while sanding the part
- Can vapour smooth with acetone

Print Setting

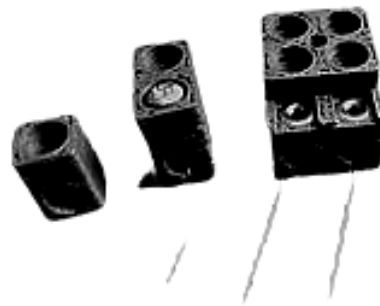
- Hotend temperature: 230~250°C
- Heated bed temperature: 80~100°C
- Part cooling fan: 0~15%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

Other ABS Variant

- [LW ABS](#)
- [Bio ABS](#)
- [ABS Fire Proof](#)
- [ABS ESD Antistatic](#)
- [ABS Carbon Fiber](#)
- [ABS Wood Filled](#)
- [PC-ABS](#)



ABS Carbon Fiber: Automotive Parts



ABS Fire Proof: Electrical Connector

PETG

(Polyethylene Terephthalate Glycol Modified)

Overview

PETG has replaced ABS as no. 2 most used material in FDM 3d printing. PETG properties sit in between PLA and ABS. It has moderate heat resistance and moderate ease of print

Strength 🦶

- Durable
- Food safe (with smooth surface)
- Heat resistant around 65°C
- Highly impact-resistant.
- Great layer adhesion
- Available in variable color
- Water resistance
- Diffuse light
- High accuracy with minimum shrinkage

Weakness 🙅

- Moderate hygroscopic (require filament dryer)
- Stringing and oozing
- Sticky to nozzle and heat block (use silicone sock)

- Harder sanding compared to ABS

Sample Print 📄



Mini Clamp



Furniture Bracket

Application 🏠

- Use for mechanical components, electronic devices housings
- Retail shop indoor and outdoor advertisement signboard
- Part get in touch with liquid like containers and bottles
- LED and lamp decoration

- Treat as good support material when printing with PLA in dual extrusion printer
- Medical/ hospital application like prosthetic, holder for patient cup

Tips

- Slicer can set to print infill first then only print wall because PETG tend to ooze when traveling
- PETG is sharp, be careful when handling it like remove support
- Drying PETG will result 10x better quality print
- When using drybox, preheat PETG 65°C for more than 2 hours

Print Setting

- Hotend temperature: 220~250°C
- Heated bed temperature: 60~80°C
- Part cooling fan: 50%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Open or Fully enclosed
- Environment: Not so concern

Other PETG Variant

- [PETG Transparent](#)
- [PETG Marble](#)
- [PET](#)
- [Bio-PT](#)
- [PETG Carbon Fiber](#)
- [PETG Wood Filled](#)



PETG Transparent: Signage



PETG Carbon Fiber: Machine Pedal

TPU

(Thermoplastic Polyurethane)

Overview

TPU is commonly known as flexible filament. It is designed to mimic rubber flexibility and create a bendable feel. TPU is often used as damping out the force to protect fragile parts.

Strength 🍏

- Flexible and Bendable
- High impact resistant
- Have different shore hardness
- 98A and above is much easy to print
- 85A and below has elasticity
- Resistant to abrasion, oil, chemical and wearing
- Excellent interlayer adhesion and no curling or delamination
- Available in variable color
- Withstand much higher compressive and tensile forces

Weakness 🙅

- Moderate hygroscopic similar like PETG (require filament dryer)

- 85A and below shore hardness require Direct Extruder setup
- Printing speed has to be slow
- Difficult to remove support, raft
- Diameter might change if pull the filament
- Not consider foodsafe
- Low shore hardness is hard to fine tune extrusion flow rate

Sample Print 📄



Shoes Insole



RC Car Tyre

Application

- Sporting goods and footwear
- Shoes insole
- Automotive O ring
- Kid soft toy
- Anti Slip holder
- GoPro holder
- Drone spare part
- RC car tyres
- Phone cover

Tips

- Best to use direct extruder to print TPU
- Flexibility can be varies by infill percentage
- Extruder output has to be minimum space to prevent buckling around drive gear
- Increase temperature able to reduce friction
- of TPU travel through PTFE tube
- Extruder output has to be very minimum to avoid TPU filament buckling around the drive gear

Print Setting

- Hotend temperature: 210~240°C
- Heated bed temperature: 30~60°C
- Part cooling fan: 100%

- Bed surface: Glass bed, PEI, PC
- Printing speed < 30mm/s
- Adhesive helper: Glue stick, hairspray
- Open frame printer
- Environment: Under good airflow, fan or air-conditioning

Other TPU Variant

- [TPU 72D](#)
- [TPU 98A](#)
- [TPU 85A](#)
- [TPU 75A](#)
- [TPU 65A](#)



TPU85A: Soft Toy



TPU72D: GoPro Holder

HIPS

(High Impact Polystyrene)

Overview

HIPS is often known as the cousin of ABS. HIPS has a lot of similarity properties as ABS. The difference is HIPS has lighter weight compared to ABS.

Strength 🍏

- High hardness
- High impact resistant
- Slightly lighter than ABS
- Less odour compare to ABS
- Ductile and stronger
- Useful for dual extruder, act as support structure
- Dissolve in D-Limonene
- Withstanding much higher impact forces
- Easily painted, machinable
- Food safe (with smooth surface)
- Print faster in high speed printer
- Print more detail, suitable for miniature
- More dimensionally stable

Weakness 📉

- Flammable
- Release strong and toxic Styrene fumes
- Ventilation required if print in closed room
- Required warm/ hot environment to print
- Warping while printing under air flow and cold environment
- Weaker Z interlayer bonding under opened frame printer
- Higher shrinkage rate
- Wear out hotend internal PTFE tube over time
- Fading under long term UV

Sample Print 📄



Lighting Sculpture



Act as Support

Application

- Use as part get in touch with heat like friction, moveable part
- Gear, linkage, structural
- Can be use outdoor and inside the car
- Mechanical part that move in high speed
- Building miniature and figurine
- Kids toy
- Use for end use part
- Part for car, motorcycle and bicycle

Tips

- Don't print under closed room especially where same room kid is sleeping
- Print in well ventilated environment
- Wear mask while sanding the part

- Wear glove when deal with D-Limonene to dissolve HIPS

Print Setting

- Hotend temperature: 230~250°C
- Heated bed temperature: 80~100°C
- Part cooling fan: 0~15%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

ASA

(Acrylonitrile Styrene Acrylate)

Overview

ASA is like the ABS version of material with added UV resistance feature. Outdoor number one material selection.

Strength 🍏

- Very heat-resistant and durable
- Rigid, tough and strong
- Won't turn yellow when left outside
- Heat resistance up to 90°C
- Strong UV and weather resistance
- Matte finished
- Water resistant
- Can be smooth by Acetone vapour
- High impact resistance
- Good surface finish
- Anti-static

Weakness 🙅

- Not food safe
- Releases potentially dangerous fumes
- Required hot environment to print

- Warping, shrinking or cracking while printing under air flow or cold environment
- Weaker Z interlayer bonding

Sample Print 📄



Outdoor Wind Turbine



Bird House

Application

- Automotive exterior parts
- Housing components
- Sporting goods
- Exterior signage
- Garden equipment
- Outdoor parts and fixtures

Tips

- Don't print under closed room especially where same room kid is sleeping
- Wear mask while sanding the part
- Can be vapour smooth with acetone

Print Setting

- Hotend temperature: 230~250°C
- Heated bed temperature: 80~100°C
- Part cooling fan: 0~15%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

PA / Nylon

(Polyamide)

Overview

PA or Polyamide commonly known as Nylon as its trade name. PA is a semi flexible material that has good wear resistance. It offers high impact and abrasion resistance.

Strength 🍏

- Semi flexible
- Excellent abrasion & wear resistance
- High toughness
- High tensile and compressive strength
- Low coefficient of friction
- Adhere paint very well

Weakness 🙅

- Highly hygroscopic (require filament dryer)
- Required pre-heat before printing and heating during printing to ensure minimum moisture
- Low layer adhesion
- Required high temperature
- High warping than ABS
- Bridging is bad

- Oozing
- Fume smell bad
- No much of color selection

Sample Print 📄



Machine Pedal



Mounting Bracket

Application 🗑️

- Plastic Gears
- Screws, nuts, bolts
- Cable ties
- Car/ drone, body
- Functional prototypes, living hinges, gears, and similar end-use parts.

Tips

- Store in airtight drybox
- Print on Garolite bed surface
Preheat PA filament at 70°C for more than 12 hours
- Use higher temperature to improve z layer adhesion
- Turn on Brim or Raft in slicer to reduce warping rate
- Nylon can also be useful for Cold Pull to clear internal hotend debris when hotend suspected have particle clog the nozzle

Print Setting

- Hotend temperature: 240~260°C
- Heated bed temperature: 50~110°C
- Part cooling fan: 0%
- Bed surface: Glass bed, PEI, Garolite bed
- Adhesive helper: Glue stick
- Fully enclosed
- Environment: No fan, no air-conditioning

Other PA Variant

- [PA 6](#)
- PA 12
- [Low Temp Nylon](#)
- [PA Carbon Fiber](#)

PC

(Polycarbonate)

Overview

PC is known as Polycarbonates which is engineering plastic that is strong, tough materials, and durable. In the real world, often seen in sports water bottles, eyes wear, bulletproof glass.

Strength 🦹

- Tough
- Survive considerable stress and heat
- Scratch resistance
- Dimensional stability,
- Durable,
- Heat resistance (over 110 °C)
- High stiffness
- Hard and Solid
- Non flexible
- Food safe (with smooth surface)

Weakness 🙅

- Extremely hygroscopic (require filament dryer)
- Required high temperature all metal hotend
- Easy warping, layer splitting
- Fumes and odor is unpleasant

- Strong tendency to ooze while printing
- Hard to sanding and polishing
- No much of color selection

Sample Print



Spring Loaded Launcher Toy



Exterior Automotive Part

Application

- Mechanical part require heat resistant
- Outdoor part
- Cover or body part
- Medical device

Tips

- Store in airtight drybox
- Preheat filament and heating while printing
- Turn on Brim or Raft in slicer

Print Setting

- Hotend temperature: 250~300°C
- Heated bed temperature: 90~110°C
- Part cooling fan: 0%
- Bed surface: Glass bed, PEI, PC bed
- Adhesive helper: Glue stick
- Fully enclosed
- Environment: No fan, no air-conditioning

Other PC Variant

[PC-ABS](#)

[PC Carbon Fiber](#)



PC-ABS: Mechanical Mount



PC Carbon Fiber: Grinder Blade

PP

(Polypropylene)

Overview

PP is known as Polypropene, a strong chemical resistance plastic commonly used in food/ drink/ supplement containers.

Strength

- Chemical resistant
- Chemically inert
- Resistant to most commonly found organic and inorganic chemicals
- Not hygroscopic
- Food Safe
- Semi flexible
- Light weight

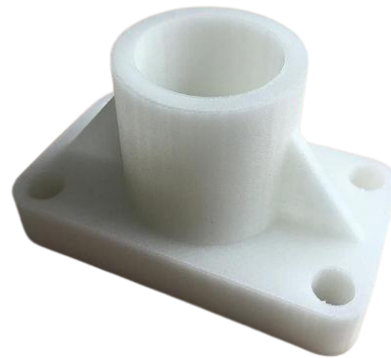
Weakness

- Hard to stick on first layer on conventional build surface
- Easy warp when printing on non PP surface
- Required high temperature heated bed
- Highly flammable
- Difficult to paint as it has poor bonding properties

Sample Print



Bendable Cap



Chemical Pipe Connector

Application

- Print lid (bending section)
- Snap fit part
- Container to store oil, chemical liquid foam

Tips

- Use PP bed surface to solve the first layer adhesion
- Use PP cellophane tape as bed surface is temporary solution because heated bed will cause the tape loose adhesive

- Apply glue stick only 50% area of the print in order to
- prevent PP filament overly stick on PP build surface

Print Setting

- Hotend temperature: 230~250°C
- Print bed: 85~100°C
- Build surface: PP Sheet
- Adhesive separator: Glue stick (apply 50%)
- Part cooling fan: 10~15% on.
- Environment: No fan, no air-conditioning

PMMA

(Polymethyl Methacrylate)

Overview

PMMA is commonly known as Acrylic, Perspex or Plexiglas from its trade name. PMMA is a strong, tough, and lightweight material which is less than half that of glass

Strength 🦹

- Strong
- Semi clear
- Light weight
- High impact strength
- Well for post processing, sanding, drilling, engraving
- Shatter-resistant
- Ability to burn away without residue
- UV tolerance
- Dissolve in acetone, therefore can be vapour smooth with acetone
- Low water absorption
- Dimension stable

Weakness 🧑

- Toxicity like ABS
- Easy wrapping
- Not food safe

- Poor solvent resistance, attacked by gasoline or similar fluids

Sample Print 📄



Machine Pipe Adapter



Outdoor Angle Joint

Application 🏠

- Part that required semi clear appearance
- Perfect for low wax casting
- Lampshades, window panes, and other objects that are fully or semi-transparent

- Use as outdoor signage

Tips

- Use enclosure when printing PMMA
- Don't print under closed room especially where same room kid is sleeping
- Can vapour smooth with acetone just like ABS
- Wear mask while sanding the part

Print Setting

- Hotend temperature: 235-255°C
- Heated bed temperature: 80~100°C
- Part cooling fan: 0~15%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

POM

(Polyoxymethylene)

Overview

POM is known as acetal, delrin as its trade name. It is used for precision parts requiring high stiffness and low friction.

Strength

- Tensile strength is higher than normal nylon
- Fatigue, Creep resistance
- Water absorption is smaller than nylon
- Good dielectric properties
- Can be used normally at 120°C
- Small friction coefficient

Weakness

- Difficult to adhere first layer
- No self-extinguishing
- High shrinkage rate

Sample Print



Spur Gear

Application

- Small gear wheels
- Eyeglass frames
- Ball bearings
- Ski bindings
- Lock systems

Tips

- Use thick POM plastic plate to serve as build plate
- POM smell awful, print on well ventilated space

Print Setting

- Hotend temperature: 220-250°C
- Heated bed temperature: 90~110°C
- Part cooling fan: 0~10%
- Bed surface: POM Surface, Paper/ Cardboard
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

PVA

(Polyvinyl Alcohol)

Overview

PVA is commonly found in glue adhesive ingredients. It is sticky, washable and non toxic plastic. Often it is nature or white color.

Strength 🍏

- Dissolve in water
- Dissolve much faster in warm water with stirring
- Semi flexible
- Non toxic
- Odorless

Weakness 🙅

- Very hygroscopic
- Stringing
- Hardly to adhere on certain material
- Easily get burned when constant heat applied
- The burned PVA causes hotend clog

Sample Print 📄



Complex Figurine



Impossible Helix

Application 📌

- Act as support structure complicated, support unreachable part
- Print a complex shape where PVA printed area will be removed
- 3D printed oral dosage forms

Tips

- Use filament dehydrator while printing PVA
- Do not let PVA heat up and sit idle for too long
- In case clogging, use heat gun to melt the PVA
- Do not use in printer with share the same hotend with primary material i.e. 2 in 1 out hotend, Prusa MMU
- For professional setup, use ultrasonic cleaner to speed up and cleaner PVA remove output

Print Setting

- Hotend temperature: 190~220°C
- Print bed: 20~50°C
- Bed surface: Glass bed, PEI, PC bed
- Adhesive helper: Glue stick
- Environment: Under good airflow, fan or air-conditioning

PVB

(Polyvinyl Butyral)

Overview

PVB is tough and flexible thermoplastic with high optical clarity and good adhesion to a large number of substrates.

Strength 🍏

- Good layer adhesion
- Able to vapour smooth using IPA
- Much safer compared to ABS smoothen with Acetone
- Low warping

Weakness 🙅

- Hygroscopic
- Not suitable for mechanical parts
- Not withstand high temperature more than 50°C

Sample Print 📄



Toy (Polished by IPA)



Lamp Shade

Application 🎨

- Decoration like jewellery, vases, lamp shades
- Smooth surface figurine

Tips 💡

- Can use brush, vapour smooth, spray method to smoothen the part surface
- IPA is flammable, handle with care
- Use 0.8mm nozzle to print vase to get more optical transparent

Print Setting ⚙️

- Hotend temperature: 215°C
- Print bed: 70°C
- Build surface: Glass, PC, PEI bed
- Adhesive helper: Glue stick
- Part cooling fan: 100% on.
- Environment: Under good airflow, fan or air-conditioning

PCL

(Polycaprolactone)

Overview

PCL is a biodegradable polyester with a low melting point of around 60°C. Safe to use for the implant process in the human body.

Strength 🍏

- Biodegradable
- Low melting point of around 60°C
- Good resistance to water, oil, solvent and chlorine
- Degraded by hydrolysis
- FDA approved

Weakness 🙅

- Slow degradation rate
- Poor mechanical properties
- Low cell adhesion
- Poor bridging performance

Sample Print 📄



Knee Braces

Application 🐛

- Implantable biomaterial
- Implantable devices
- Variety of drugs have been encapsulated within PCL beads for controlled release and targeted drug delivery

Tips 💡

- Reflash printer firmware to be able to extrude at 50°C
- Print with hotend with PTFE tube linear inside
- Can be re-mold to form any shape with hot water

Print Setting ⚙️

- Hotend temperature: 50~70°C
- Heated bed temperature: 0~30°C
- Part cooling fan: 80~100%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Open frame
- Environment: Under good airflow, fan or air-conditioning

PBT

(Polybutylene Terephthalate)

Overview

PBT is a member of the polyester family. It is an engineering material with excellent mechanical and electrical properties.

Strength 🍏

- Skin safe
- Durable
- Matte surface finished
- Good toughness and impact strength
- Well insulator
- Excellent in short-term mechanical properties, such as high strength, toughness and stiffness and practical impact
- Good UV resistance
- Low moisture absorption
- Ductile
- Chemically-resistant
- Very high toughness, down to 40°C

Weakness 🙅

- Limited color selection
- A bit softer
- Prone to warping and shrinkage

Sample Print 📄



Keyboard Keypad



Automotive Part

Application 📈

- Keyboard keypad
- Wearable grade part
- Mouse cover
- Electronic parts, electrical parts
- Automotive part
- Medical part

Tips

- Print like ABS, best to have fully enclosure to
- retain dimension stability
- Can design part area that have skin contact with PBT material while the rest can use other material

Print Setting

- Hotend temperature: 235-255°C
- Heated bed temperature: 80~100°C
- Part cooling fan: 0~15%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

PCTG

(PolyCyclohexylenedimethylene Terephthalate Glycol-Modified)

Overview

PCTG is similar to PETG in application and molecular structure. However, PCTG has higher chemical resistance, a larger range of printing temperatures, and increased durability.

Strength

- Suitable for contact with food – BPA free
- High impact strength
- High toughness
- Temperature resistance and clarity,
- Dimensional stability,
- Low shrinkage
- High chemical resistance

Weakness

- Moderate hygroscopic (require filament dryer)
- Stringing and oozing
- Sticky to nozzle and heat block (use silicone sock)
- Harder sanding compared to ABS

Sample Print



Clamp



Water Bottle

Application

- Industry spare parts, short series, utility models
- Automotive elements in the engine compartment, housing of vehicle components, air intakes, fluid funnels
- Sport accessories, pads, airsoft elements

Tips

- If use in contact with food, make use print surface post processing to smooth

Print Setting

- Hotend temperature: 250-270°C
- Heated bed temperature: 90-110°C
- Part cooling fan: 20~50%
- Bed surface: Glass bed, PEI, PC
- Adhesive helper: Glue stick, hairspray
- Fully enclosed
- Environment: No fan, no air-conditioning

PPS

(Polyphenylene Sulfide)

Overview

PPS high performance plastic that is rigid and opaque polymer with a high melting point (280°C)

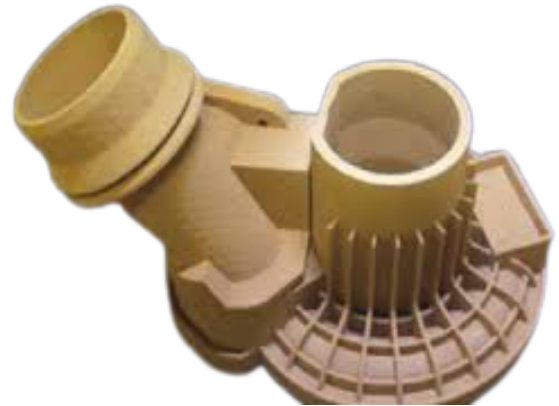
Strength

- High-performance engineering thermoplastic
- High temperature performance
- Dimensional stability
- Excellent electrical insulation properties
- Rigid and opaque
- Fire Resistance
- Good chemical resistance
- resistance to heat, acids, alkalis, mildew, bleaches, aging, sunlight, and abrasion. It absorbs only small amounts of solvents and resists dyeing.

Weakness

- Highly hygroscopic
- Warping while printing under air flow and cold environment
- Required industrial fully enclosed high temperature 3d printer
- Not food safe

Sample Print



Automotive Components

Application

- Filter fabric for coal boilers
- Papermaking felts
- Electrical insulation
- Specialty membranes, gaskets, and packings.

Tips

- Use Filament Dryer while printing
- Must use a fully enclosed 3d printer. Best to have heated chamber
- Must use All Metal Hotend
- Turn off part cooling fan

Print Setting

- Hotend temperature: 290-325°C
- Heated bed temperature: 80~100°C

- Part cooling fan: Off
- Bed surface: Glass bed
- Adhesive helper: Magigoo HT
- Fully enclosed
- Environment: No fan, no air-conditioning

PEI

(Polyetherimide)

Overview

PEI is an amorphous, amber-to-transparent thermoplastic with characteristics similar to the related plastic PEEK. It has a trade name called Ultem.

Strength

- Resist high temperatures
- Stable electrical properties over a wide range of frequencies
- Excellent chemical resistance
- High ductile properties
- Solvent resistance and flame resistance
- High dielectric strength, inherent flame resistance
- Extremely low smoke generation
- High mechanical properties and performs in continuous at 170 °C
- Easily machined and fabricated with excellent strength and rigidity

Weakness

- Highly hygroscopic

- Warping while printing under air flow and cold environment
- Prone to stress cracking in chlorinated solvents
- Required industrial fully enclosed high temperature 3d printer
- Not food safe

Sample Print



Aerospace Components

Application

- Automotive
- Aircraft, rocket
- Medical and chemical instrumentation steam exposure

Tips

- Use Filament Dryer while printing
- Must use fully enclosed 3d printer
- Best to have heated chamber

- Must use All Metal Hotend
- Turn off part cooling fan

Print Setting

- Hotend temperature:
355-390°C
- Heated bed temperature:
120-160°C
- Part cooling fan: Off
- Bed surface: Glass bed, PEI
- Adhesive helper: Magigoo HT
- Fully enclosed
- Environment: No fan, no
air-conditioning

PEEK

(Polyether Ether Ketone)

Overview

PEEK is offering exceptional performance over a wide range of temperatures and extreme conditions. A unique combination of thermal, mechanical qualities and excellent long-term chemical resistance.

Strength

- Excellent mechanical resistance
- Chemical resistance properties that are retained to high temperatures
- Highly resistant to thermal degradation
- Resist attack by both organic and aqueous environments
- Easily machinable
- Glass transition temperature: 145°C

Weakness

- Highly hygroscopic
- Cost expensive
- Warping while printing under air flow and cold environment

- Required industrial fully enclosed high temperature 3d printer
- Not food safe

Sample Print



Aerospace Components

Application

- Aerospace, automotive, teletronic, and chemical industries
- Bearings, piston parts, pumps, high-performance liquid chromatography columns, compressor plate valves, and electrical cable insulation.
- Spinal fusion devices and reinforcing rods

Tips

- Need to pre-heat filament before being use
- Use Filament Dryer while printing
- Must use fully enclosed 3d printer

- Must have heated chamber
- Must use All Metal Hotend
- Turn off part cooling fan

Print Setting and Condition

- Hotend temperature:
370-410°C
- Heated bed temperature:
120~140°C
- Heated chamber: 160~180°C
- Part cooling fan: 0%
- Bed surface: Glass bed
- Adhesive helper: Magigoo HT
- Fully enclosed
- Environment: No fan, no
air-conditioning