#### \*Possibly for future work in thesis, Chapter 5

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#### **CFPLA**

The print settings used for effective printing of PLA are very similar to that of CFPLA. The melting point is still anywhere from 200-230 degrees Celsius, and the bed adhesion will behave similarly to PLA. However, the added fibers in the filament can cause clogging and increasing oozing while printing. Experts recommend using a hardened steel nozzle to prevent damage to the extruder. To prevent clogs from starting to form in the tube, experts also suggest initially reducing the print speed by 25-50%. These tradeoffs must be considered when deciding on a filament to test for our extruder.

Carbon Reinforced PLA is a material steadily increasing in popularity due to its strength and ability to be 3D printed. There are two types of this material with the first being short fiber reinforced thermoplastics (SFRT) and the second being continuous fiber reinforced thermoplastics (CFRT) [[26]](https://www.zotero.org/google-docs/?rMiJHb). Short fiber reinforced thermoplastics consist of small pieces of carbon fiber embedded in the PLA filament. Continuous fiber reinforced thermoplastics consist of a long strand of carbon fiber embedded into the filament usually during the process of printing.

For continuous fiber reinforced thermoplastics, flexural strength was found to increase with higher printing temperatures up to 240 degrees celsius where inaccuracy of the print started to rise [[27]](https://www.zotero.org/google-docs/?WphIuy). Strength also increased as layer thickness decreased and hatch spacing decreased and it reached a high with a feed rate of 80 mm per minute before decreasing slowly. The flexural strength of the tested continuous carbon fiber composite was able to reach a maximum of 335 MPa with a carbon content of 27%[[1]](https://www.zotero.org/google-docs/?AvWWzJ).