3D printing has attracted great interest over the past three decades due to its high precision, less waste generation and design freedom[1-3]. One of the major challenges 3D printing is the poor mechanical performance of pure polymer parts. Researchers used traditional carbon and glass fiber reinforced composites to overcome this issue [4-7]. The traditional fibers can improve the mechanical properties of printed parts. However, the manufacturing techniques and printing process restrict the overall performance of the printed parts. Thermotropic liquid crystalline polymer (TLCP) is another reinforcement which offers lighter weight, lower viscosity, excellent mechanical performance and great recyclability [8-17]. TLCPs are capable of forming extended conformations when subjected to extensional or shear deformation. The formation of highly orientated molecular structure enables the generation of high mechanical properties.

In this study, polyamide was reinforced with TLCP by the dual-extrusion technique to generate high performance composite filaments [18]. Rheological tests were used to optimize the processing conditions of the dual-extrusion process, which could minimize the degradation of matrix polymer. High performance and lightweight fiber-reinforced composite parts were fabricated by utilizing the fused filament fabrication (FFF) technique. The composite filaments were printed at the temperature below the melting point of TLCP to avoid the relaxation of TLCP. The mechanical performances of printed parts are greater than 3D printed parts which are reinforced by conventional fibers.
Reference

