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Investigation of the Tensile Properties in Continuous Glass Fiber–Reinforced Thermoplastic Composite Developed Using Fused Filament Fabrication

Reference

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ABSTRACT

Continuous fiber–reinforced thermoplastic composites are gaining acceptance in the manufacturing sector. However, the production constraints of intricate designs, the difficulty of using unique fiber alignment, and the expensive moldings make their usage inadequate. This investigation attempts to produce composites using continuous glass fiber as filler material and three distinct polymers, acrylonitrile butadiene styrene, polylactic acid, and polyethylene terephthalate glycol, utilizing an indigenously built nozzle attachment with the fused filament fabrication (FFF) process. Furthermore, scanning electron microscopy (SEM) images were used to elucidate the interface performance. The experimental results showed that the tensile strength of glass fiber–reinforced composites was 218 to 241 % greater than that of just thermoplastic specimens when the printing raster direction was 0° and 35 to 45 % lower when the printing raster orientation was 90°. Furthermore, SEM findings revealed that the tensile stress was very low and had bad interface behavior when the printing raster orientation was 90°. FFF has more adaptability for fiber reinforcement because of its meticulous orientation and good dispersal capabilities for the additively manufactured part, which may be directly used as the final product. The fiber content and its interfacing with base material are critical technical specifications for the composites.

Keywords

fused filament fabrication, glass fiber, acrylonitrile butadiene styrene, polylactic acid, polyethylene terephthalate glycol, continuous reinforcement, tensile properties enhancement

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