

Fatigue and impact properties of 3D printed PLA reinforced with kenaf particles

ABSTRACT

The increasing demand on the production of ankle-foot orthosis (AFO) leads to the implementation of 3D Printing technology into the manufacturing process, due to its fast production, good design optimization, and cost-effectiveness. Now, several research works were made to implement natural composite as the 3D Printer filament to increase the sustainability of the material, as well as reduce the AFO's weight and raw material cost. However, since this AFO will be used on a daily basis, it is significant to understand the weight, fatigue and impact strength of the orthosis since they affect the user's safety. The aim of this paper is to investigate the density, fatigue and impact strength of the printed kenaf/PLA composite for its possible usability for AFO. The filler within the kenaf/PLA composite was varied at 3, 5 and 7 wt. % and extruded to obtain the composite filament, which was used with 3D printer to print out the specimens used for density, impact, and fatigue test. As the amount of fillers increased, the density and impact resistance decreases while fatigue life increases. In conclusion, the results found in the density and fatigue tests show a positive perspective towards its usability for AFO.

Keyword: 3D printing; Fatigue; Additive manufacturing; Izod impact; Kenaf powder; Polylactic acid