THE EFFECT OF FIBER ORIENTATION AND INFILL PATTERN ON FLEXURAL STRENGTH OF ADDITIVELY MANUFACTURED COMPOSITE SPECIMEN

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Abstract

Additive Manufacturing (AM), also known as 3D Printing, has been there for more than two decades and has recently gained importance for manufacturing functional products. AM has excellent developments in recent days with a huge number of applications in industry, automotive, aerospace, medical, architecture, food, fashion, etc. Composite materials are widely used in structures with weight as a critical factor especially in aerospace industry. In recent periods, AM has gained lot of importance in fabricating composite material. Fused Deposition Modelling (FDM) is one of the promising AM technology used for the fabrication of complex geometry product using continuous fiber reinforced composite material. There is lot of research on effect of fiber orientation on flexural strength of composite materials made using conventional manufacturing processes. It will be interesting and significant to study the effect of fiber orientation (0°, 0°/90°, +45°/-45°) and infill pattern (honeycomb, triangular & rectangular) on flexural strength of additively manufactured continuous fiber reinforced polymer composite. Now-a-days, continuous fiber reinforced thermoplastic composite materials are becoming more important in industrial applications due to inherit advantages such as excellent mechanical performance, recycling and potential lightweight structures. In present study, carbon was used as continuous fiber reinforced material which has high flexural resistance. The FDM based 3D printer named Markforged Mark Two was used to fabricate the test specimen. This work aims to investigate and find out the best combination of fiber orientation and infill pattern that has better flexural strength for additively manufactured polymer composite Further, microstructural analysis was conducted to investigate the fracture mechanism, morphology, and printing quality of the test specimens.

Keywords: additive manufacturing, 3D printing, composite material, carbon fiber, flexural testing