Effect of infill pattern, density and material type of 3D printed cubic structure under quasi-static loading

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ABSTRACT

The present research work is aimed to investigate the effect of infill pattern, density and material types of 3D printed cubes under quasi-static axial compressive loading. The proposed samples were fabricated though 3D printing technique with two different materials, such as 100% polylactic acid (PLA) and 70% vol PLA mixed 30% vol carbon fiber (PLA/CF). Four infill pattern structures such as triangle, rectilinear, line and honeycomb with 20%, 40%, 60%, and 80% infill density were prepared. Subsequently, the quasi-static compression tests were performed on the fabricated 3D printed cubes to examine the effect of infill pattern, infill density and material types on crushing failure behaviour and energy-absorbing characteristics. The results revealed that the honeycomb infill pattern of 3D printed PLA cubic structure showed the best energy-absorbing characteristics compared to the other three infill patterns. From the present research study, it is highlighted that the proposed 3D printed structures with different material type, infill pattern and density have great potential to replace the conventional lightweight structures, which could provide better energy-absorbing characteristics.

KEYWORDS

3D printed structure; Damage behaviour; Density; Infill pattern; Material type; Quasi-static loading

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