Potentiality of MWCNT on 3D-printed bio-inspired spherical-roof cubic core under quasi-static loading

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ABSTRACT

Sandwich panel is increasingly used as lightweight energy absorbing components, which provides excellent crashworthiness performance with the three-dimensional periodic core. This paper investigates 3D-printed bio-inspired spherical-roof cubic cores with multi-walled carbon nanotubes (MWCNT) and foam-filled cores under quasi-static loading. The proposed bio-inspired spherical-roof cubic cores with 1.5 mm wall thickness were manufactured using the fused filament fabrication process, which used 70% polylactic acid (PLA) and 30% carbon fiber filament. Moreover, four groups of 3D-printed bio-inspired spherical-roof cubic cores were compared and analyzed on compressive properties and failure behavior. Experimental results were shown that foam-filled double bio-inspired spherical-roof cubic core with MWCNT was the maximum F_{peak} with 1.92 kN, which provided a much more stable plateau load and better energy-absorbing characteristics. In addition, it is conducted that a double bio-inspired spherical-roof cubic core with four notches core is considered as the potential energy-absorbing core.

KEYWORDS

3D-printed core; Bio-inspired spherical-roof cubic core; MWCNT; Quasi-static loading; Three-dimensional periodic core

ACKNOWLEDGEMENTS

The authors would like to acknowledge the Ministry of Education Malaysia : FRGS/1/2019/TK03/UMP/02/10 , and the Faculty of Mechanical & Automotive Engineering Technology, Universiti Malaysia Pahang (UMP) : RDU1901126 for funding this research. This research work is strongly supported by the Makers Lab and the Structural Performance Materials Engineering (SUPREME) Focus Group, Universiti Malaysia Pahang .