Deformation pattern of cellular mechanical interface in a bi-material structure fabricated by material extrusion additive manufacturing

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Abstract

This research focuses on the investigation of the deformation behavior and mechanical response of the cellular structure-based mechanical interlocking interface designs for bi-material structures fabricated by material extrusion additive manufacturing (AM). Three different cellular designs, including auxetic, body centered cubic (BCC), and octahedral, were investigated. In addition, the effects of build orientation and interface polarity were also included in the study. Utilizing both finite element analysis and experimental characterization, the deformation characteristics and fracture patterns of these structures were investigated. The results show that the failure of the interlocking interface is significantly influenced by geometry design, printing orientation and the intrinsic material interfacial bonding strength. In particular, the choice of interface geometry design appears to be related to the intrinsic material interfacial bonding strength between the two materials, indicating design flexibility with this design concept.

Biography of Sumit Paul

Sumit Paul is a PhD candidate in Industrial Engineering department at the University of Louisville. He received his BS in Industrial and Production Engineering at the Bangladesh University of Engineering and Technology in 2019. His research interests are in modelling and characterization of Additively Manufactured cellular lattice structures.