Mechanical Behaviour of Macroscopic Interfaces for 3D Printed Multi-material Samples

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Abstract. The development of Additive Manufacturing technologies introduced new possibilities regarding multi-material part production. Fused Filament Fabrication (FFF) is one of those technologies suitable for multi-material 3D printing. Usually, multi-material parts are manufactured from different blends of the same material, also known as multi-color 3D printing, or from materials with good chemical compatibility. However, the mechanical performance of multi-material parts is frequently based on a simple face-to-face contact interface be-tween parts bodies and a physical bond between thermoplastics. In this regard, the paper aimed to investigate the performance of the contact interface of multi-material components using a geometrical approach. Therefore, multiple inter-locking interfaces were investigated, such as Ω-shape, T-shape, dovetail, and others. For a broader understanding of the interlocking interfaces, the experimental runs consisted of a group of compatible thermoplastic materials, acrylonitrile styrene acrylate (ASA) and thermoplastic polyurethane (TPU), and low-compatible, i.e., polyethylene terephthalate glycol (PETG) and polyamide (PA). The results showed that macroscopic interlocking interfaces could enhance the mechanical properties.

Keywords: fused filament fabrication, multi-material, interlocking mechanism, contact interface

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