

Tensile Properties of 3D Printed PLA under Unidirectional and Bidirectional Raster Angle: A Comparative Study

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Abstract : Fused deposition modeling (FDM) gains popularity in recent times, due to its capability to create prototype as well as functional end use product directly from CAD file. Parts fabricated using FDM process have mechanical properties comparable with those of injection-molded parts. However, performance of the FDM part is severally affected by the poor mechanical properties of the part due to nature of layered structure of printed part. Mechanical properties of the part can be improved by proper selection of process variables. In the present study, a comparative study between unidirectional and bidirectional raster angle has been carried out at a combination of different layer height and raster width. Unidirectional raster angle varied at five different levels, and bidirectional raster angle has been varied at three different levels. Fabrication of tensile specimen and tensile testing of specimen has been conducted according to ASTM D638 standard. From the results, it can be observed that higher tensile strength has been obtained at 0° raster angle followed by 45°/45° raster angle, while lower tensile strength has been obtained at 90° raster angle. Analysis of fractured surface revealed that failure takes place along with raster deposition direction for unidirectional and zigzag failure can be observed for bidirectional raster angle.

Keywords : additive manufacturing, fused deposition modeling, unidirectional, bidirectional, raster angle, tensile strength

Conference Title : ICMSE 2018 : International Conference on Manufacturing Science and Engineering

Conference Location : Sydney, Australia

Conference Dates : March 29-30, 2018