Preliminary Investigations of Acrylonitrile Butadiene Styrene (ABS) Properties

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Abstract. Fused deposition modelling (FDM) which trending nowadays became a very promising additive manufacturing (AM) technique to process polymers. Even though, FDM had achieved a remarkable development, the mechanical strength of it's products still in arguable condition. Following that, various researches have been done before to study the effect of printing parameters on the mechanical properties of FDM parts. Thus, the aim of this research is to investigate the effect of printing parameters on the tensile properties of the acrylonitrile butadiene styrene (ABS) printed parts using FDM technique and to identify optimum parameter to print parts with this combination. Implementation of this research covers printing of tensile test specimens using ABS thermoplastic according to ASTM D638-Type 1 standard with combinations of different raster angle and infill percentage. Tensile test followed by it's analysis had been done for all the specimens. The optimum parameter to print with the combination of ABS and FDM is discovered. The optimum raster angle and infill percentage to print using ABS and FDM are 55° and 80% respectively. The specimen printed with those parameters achieved highest ultimate tensile strength, elastic modulus and yield strength which are 33.78MPa, 25.17MPa and 787.68MPa respectively.

Keywords: 3D Printing, FDM, ABS, Tensile Testing, Elastic Modulus

1. Introduction

Fused deposition modelling (FDM) is one of the prominent additive manufacturing (AM) technique which implies material extrusion as it's working principle(1). FDM which merges both AM and material extrusion is carried out by depositing extrusions of feed material on the heated platform layer by layer until the whole 3D part is fully fabricated(2, 3). This contradicts to subtractive method which has a lot of drawbacks especially in concerning material wastage and overall process feasibility(4, 5). Besides that, FDM permits the manufacturing process of any part to be done in a very short period with simpler and allows the parts with complex geometries produced easily without following the procedures as in the conventional