

3D Printing: Overview of ABS Evolvement

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Abstract. Rapid prototyping is highly applied to polymer processing since it exhibits various advantages compared to other conventional polymer processing technique such as injection molding, blow molding and etc. One of the most common rapid prototyping technique is fused deposition modelling (FDM) which work based on material extrusion mechanism. FDM referred to be the common in various applications because it doesn't require complicated steps and very cost saving. Among the bunch of applications of FDM, one of the polymer that has a major association with this technique is acrylonitrile butadiene styrene (ABS). ABS is a thermoplastic which become liquefied when heating and harden when cooled down. ABS incorporated with FDM in various method to extend its uses into more areas. Thus, this paper reviews the FDM process in detail which includes theoretical aspect of FDM, working mechanism of FDM process, printing parameters and applications of FDM. Addition to that, this paper also reviews the theory of ABS, composites of ABS in use and researched before and their preparation techniques for FDM also included. Characterization techniques and their respective properties of fused deposition modelled ABS is also part of this review paper.

Keywords: 3D Printing, ABS, Tensile Testing, Elastic Modulus, Mechanical Properties

1. Introduction

Additive manufacturing (AM) was introduced to the world in the early 1980s when the term stereolithography (STL) was first utilized in a U.S. patent by Charles W. Hull in 1986 (1). Additive manufacturing is process that contradict with the traditional manufacturing method which uses removal concept. The latter method is not only consumes and waste raw materials abundantly but costly and even time consuming processes involved too. It involves production of a prototype or a product by addition of materials layer by layer in the form liquid, powder or semi-molten material to form the fully functional desired product as per design(2). There are various type of techniques used in the concept of additive manufacturing. Fused deposition modelling, 3DP, selective laser sintering, electron beam melting, laser engineered net shaping and polyjet are some of the examples of additive manufacturing techniques. All