**Tensile properties of Carbon infused Polylactic acid composite filament for Fused deposition modeling in Additive manufacturing**

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**ABSTRACT**

Fused deposition modeling works with engineering-grade thermoplastics to build strong, durable and dimensionally stable parts with the best accuracy than that of various conventional molding processes and can be used as functional prototypes, manufacturing tools and production parts in various engineering applications. In these applications, the eco friendly material Poly lactic acid (Pla) is being used as it offers low material cost for fast-draft print parts. To widen the engineering applications, there is a necessity of improvement in the mechanical properties of pure plastics. One of the possible solutions to fore mentioned problem is reinforcement of the polymers with appropriate proportions of reinforcements. The present work focuses on the effect of carbon fiber reinforcement (10%) in Pla on the mechanical properties. The tensile samples has been prepared by using fuse deposition method by varying the process parameters are of 0.2/0.3/0.4 mm layer thickness, air gap 0.8/0.53/0.4 mm, 00 /45/ 900 orientation, 2000/2100/2200 temperature with Brass/hardened steel/TiC nozzle and tested as per the ASTM-D 638 standards. Here, L27 array of Taguchy optimization technique was adopted. It is observed from the experimental results that the significant improvement in the tensile strength which is 70 MPa and modulus 3.5Gpa at an optimal parameter set of 0.2 layer thickness/900 orientation/2200 printing temperature with TiC nozzle when compared to pure Pla having 45-60 MPa from the literature. Hence, it can conclude that with the addition of 10% carbon fiber in the pure Pla causes approximately 25% improvement in the mechanical properties.

*Keywords: Fused deposition modeling, carbon infused Pla, Tensile properties.*