

Effect of Process parameters–Structure–Properties in hybrid Polymer compositematerial in AdditiveManufacturing via Material Extrusion

Presently bio-polymer (PLA, ABS) matrix composites reinforced with carbon fibre, basalt fibre, graphene, and etc. are being used more because of their favorable mechanical, thermal, and tribological properties in spite of their being more expensive materials. Engineered bio-composite is needed to meet the needs of users for commodity and medical products which will simultaneously maximize the sustainability of natural resources. These engineered bio-composite are opening new markets in the field of automotive, household, automobile, aerospace, medical and dental, textile and architecture. Composite materials consist of a matrix and a reinforced chosen to achieve the desire mechanical properties and application. As solid abrasive nanoparticles impinge against a target surface, it causes local damage combined with material removal. The selected reinforcement (pre-defined wt.%) and matrix materials are fabricated as a hybrid wire form by using the screw extrusion method. The composite wire extruded is evaluated for mechanical testing and metallurgical characterization techniques. The dimension of composite wire is measured through a scanning electron microscope and the reinforcement is confirmed through electron imaging. To study the printability of composite biopolymer material, a fused filament fabrication (FFF) 3D Printing machine is used to print the test sample. In this present proposal, the fabricated samples are subjected to evaluate mechanical, thermal, and tribology properties. Through an electron microscope, the dispersion of reinforcement (fibre and nano abrasive particle)s in the matrix material is confirmed with good bonding. Furthermore, analysis of variance (ANOVA) will be used to find out the optimum process parameters of the FFF process.

Keywords: - FFF, polymer composite, screw extrusion, abrasive nano particle, ANOVA.