PAPER ID:101

EXPERIMENTAL INVESTIGATION ON TENSILE STRENGTH OF ABS AND CARBON FIBER PLA MATERIALS BY OPTIMIZING THE ADDITIVE MANUFACTURING PROCESS PARAMETERs

Debashis Mishra

CMR Technical Campus, Kandlakoya, Medchal, Hyderabad, Telangana State, 501401, India

ABSTRACT

Rapid prototyping of complex and intricate shapes and parts has become easier, quicker, and cost- effective with the introduction of 3D printing technology. The printing concept is the addition of thermoplastics materials by layers. The different thermoplastics that are commonly used in prototype fabrication are Acrylonitrile butadiene styrene (ABS), Carbon fiber PLA which is attempted to print the tensile specimens as per the ASTM D638 standard. The selected process parameters for 3D printing of said thermoplastics are infill density, print speed, and layer thickness. The ranges of such process parameters are chosen based upon the literature studies and trial experiments conducted which is like infill density 40, 60, 80 (%), print speed 60, 80, 100 (mm/min), and layer thickness 100, 200, 300 (microns). The numberof experiments is planned and performed using the Taguchi L9 approach to identify the effects of chosen process parameters on tensile strength. The strength of printed ABS, carbon fiber PLA specimens are experimentally performed and compared to suggest the best and suitable material for the successful use in the fabrication of prototypes, other complex geometries and parts particularly in the aerospace and automotive industries to achieve a good strength to weight ratio which will beneficial for better thrust generation and fuel economic.

Keywords: Acrylonitrile butadiene styrene (ABS), Carbon fiber PLA, Fused deposition modeling technique, Taguchi L9 experimental design, Ultimate tensile strength.