

On recyclability of secondary recycled ABS as fused filament for FDM technique of additive manufacturing

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Abstract.

Long-chain stable polymeric structure of thermoplastic polymers imposes critical issues worldwide related to their management. Recycling of these polymer wastes becomes the only solution to minimize their adverse affects on environment. In this article, the researchers fabricated fused filaments (in-house) for fused deposition modeling (FDM) technique of additive manufacturing (AM) from secondary recycled acrylonitrile butadiene styrene (ABS) by using twin screw extruder (TSE). After measuring the melt flow index (MFI) of the secondary recycled ABS, the TSE process parameters (extrusion load, temperature and rpm/speed) were varied to explore their influence on the various properties (rheological/mechanical/thermal) of the fabricated filaments. Thermal analysis was performed to estimate the heat carrying capacity of fused filaments after repeated cycles of heating and cooling. Taguchi's L9 orthogonal array has been utilized for the execution and analysis. The parametric settings of 10 kg load, 235⁰C extrusion temperature and 70 rpm speed yields the combined optimized values of peak strength and percentage break elongation for the fused filaments.