

Magnetic composite based on ABS polymer and iron powder for 3D printing

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Additive manufacturing (AM) is a modern technology that allows to fabricate complex products from various materials and has many advantages compared to traditional production methods. Magnetic materials are related to many essential applications. They are key components of motors, generators, transformers, magnetic-coolers, and many others. In this work, we present research on a magnetic composite designed for AM. The composite material with magnetic properties was prepared from acrylonitrile butadiene styrene (ABS) and iron (Fe). The components in various ratios (Fe powder from 50% to 75%) were mixed mechanically and thermally compounded through a single-screw extruder. The physical properties of composites were investigated by X-ray diffraction, density, electron microscopy, magnetization, specific heat, and mechanical properties measurements. Structural measurements showed that Fe particles do not agglomerate or oxidize during the composite synthesis process. Soft ferromagnetic properties for all prepared samples were confirmed by magnetic studies. The results were compared with those obtained for a commercially available polylactide-based (PLA) material. Finally, 1.75 mm diameter filament was fabricated and the electromagnet components were printed using the fused deposition modeling (FDM) technique.