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Abstract

Additive manufacturing such as selective laser sintering (SLS) offers the strategies to create 3D complex components with desirable mechanical, electrical and thermal properties using the composite powders as feeding materials. This work proposes a new fabrication approach to preparing carbon nanotube (CNT) composite powders and utilizes them for SLS process. As compared with the hot-compression process, the SLS process could offer an effective method to fabricate the CNT/Polymer composite with electrically conductive segregated structures. At a small loading range of CNTs (<1wt%), the laser-sintered composites exhibit significant improvements in the electrical conductivity up to anti-static and conductive range qualifying the applications in automobile and aerospace. However, the enhancement in thermal conductivity of laser-sintered composites is not comparable with that of hot-compressed ones. The process-structure-property relationships are further investigated to study the different processes induced microstructures and the underlying mechanism of thermal and electrical performances.

Keywords: Additive manufacturing, selective laser sintering, polyurethane, carbon nanocomposite, polyamide 12, electrical and thermal conductivities

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