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On the improved properties of injection-molded, carbon nanotube-filled PET/PVDF blends

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Abstract

The mechanisms for improved mechanical and electrical properties of an injection molded, carbon nanotubes (CNTs) filled, polyethylene terephthalate (PET)/polyvinylidene fluoride (PVDF) blend have been investigated. It is found that the improved properties are due to the formation of a triple-continuous structure in the CNT-filled polymer blend; CNT segregates in the continuous PET phase, forming a continuous conductive path to provide the composite an electrical short circuit. The continuous PVDF phase free from CNT, on the other hand, offers crack bridging and the interface between the PET and PVDF phases provides crack deflection for the composite. As a result of such a combination, the CNT-filled PET/PVDF has better electrical conductivity, strength and elongation than the CNT-filled PET with the same CNT loading. The segregation of CNT in the PET phase of the CNT-filled PET/PVDF blend is due to the thermodynamic driving force that favors the segregation of CNT in the PET.

Keywords: PEM fuel cells; Bipolar plates; Carbon-filled polymers; Polymer blends