Abstract

Reinforcement of thermoplastic matrices with liquid crystalline polymers (LCP) has been studied extensively by different research groups. Results show that thermotropic LCP generally form in situ fibers in a polymer matrix, under suitable conditions, which can reinforce the base matrix. To achieve the in-situ fibrillation, a draw force is required to deform the rigid LCP domains into the fibrillar form. This draw force can be generated by the high viscous polymer matrix on the LCP domains during blending. But unfortunately most of the polymer blends are incompatible in nature which trigger the interfacial slippage at the polymer-LCP interface and hence trim down the drag force of base matrix upon LCP domains and restricts the LCP fibrillation. To counter this incompatibility, compatibilizers have been used to increase the interfacial adhesion and LCP fibrillation. However, compatibilizers for the polymers, processed at very high temperatures, needs to be highly thermal stable to sustain that processing temperature, without degradation. This problem can be solved by the use of carbon nanotubes which are highly thermal stable and due to their high aspect ratios; they can bind the two polymer phases together.

In the present study MWCNTs have been coated with SiC and TiO_2 to improve their dispersion in the blend matrix and to make their surface rough to reduce the slippage at the polymer-CNT interface. Then these modified MWCNTs were dispersed in different blend systems to analyze their effect on the fibrillation of LCP. In addition to that the dispersion of nanotubes, in the blend matrix, along with mechanical, thermal, rheological and morphological properties of blends were studied. It was observed that modified MWCNTs improved the fibrillation of LCP and mechanical and thermal properties of blends. Comparison of compatibilizing ability of MWCNTs with polyphosphazene revealed that better fibrillation was achieved in presence of modified MWCNTs. it was also observed that in comparison to nanosilica and nanoclay modified MWCNTs produced better fibrillation of LCP.

Keywords: polymer blend, multi-walled carbon nanotubes, bridging effect, liquid crystalline polymer, structural –property relationship.