Characterization of polyamide 6.10 composites incorporated with microcrystalline cellulose fiber: Effects of fiber loading and impact modifier

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ABSTRACT

Microcrystalline cellulose (MCC) fiber-reinforced polyamide 6.10 (PA) composites were prepared in the presence of an impact modifier (IM), exxelor VA1803 (VA), by melt compounding process. Fiber loading was considered from 20 to 30 wt.%, whereas IM was varied from 2.0 to 5.0 wt.%. Composites were characterized by tensile test, impact test, dynamic thermal mechanical analysis (DTMA), differential scanning calorimetry (DSC), thermogravimetric analysis (TGA), and X-ray diffraction (XRD). Composites' fractured surfaces were examined by scanning electron microscope (SEM). In addition, fiber size distribution was also analyzed. Result analyses showed that the fiber incorporation changed the tensile strength (TS) slightly, but the tensile modulus (TM) significantly. The TM was found to be improved by 45% at the amount of fiber loading of 30 wt.%. Moreover, the thermomechanical properties revealed that the storage modulus (SM) and loss modulus (LM) were increased due to the incorporation of MCC, which was improved further by the uses of 5.0 wt.% of VA. The MCC possess high crystallinity index and high crystallite size along with enhanced mechanical and thermal properties. Therefore, the extraordinary benefit of using MCC in PA was evaluated in terms of thermomechanical, structural, and thermal properties in the presence of the impact modifier.

KEYWORDS

Coupling agent, microcrystalline cellulose (MCC), polyamide composite, thermomechanical

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