IMPROVING OF THERMAL AND ELECTRICAL CONDUCTIVITIES OF IPP/WAX/AG NANOCOMPOSITES THROUGH DIFFERENT MELT-MIXING CONDITIONS

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ABSTRACT

Nanocomposites based on isotactic polypropylene (iPP) and Ag nanoparticles blended with soft paraffin wax were studied. The aim of this study is to improve the thermal and electrical conductivities of iPP and an iPP/wax blend filled with Ag nanoparticles. iPP was used as a supporting material to prevent paraffin wax leakage during phase change. Soft paraffin wax was selected as the phase change material (PCM). The silver powder was used as conductive filler for the improvement of thermal and electrical conductivities. The samples with 10 wt% wax and 2 wt% Ag were obtained by melt mixing in different conditions. After melt mixing, cooling of the melt was performed using two cooling methods: slow cooling in the melt press and quenching at 0 °C. Differential scanning calorimetry (DSC), optical microscopy, and thermal and electrical conductivity were used to study the effect of the preparation conditions on the structure and transport properties of iPP/wax/Ag composites. The DSC results show an increase in the degree of crystallinity for the composites slowly cooled in the press. All the iPP/Ag and iPP/Wax/Ag nanocomposites slowly cooled in the press show higher electrical conductivities than the nanocomposites quenched at 0 °C. The thermal conductivities of the nanocomposites quenched at 0 °C are lower compared to those slowly cooled in the press. Increasing the mixing temperature was found to decrease both the thermal and electrical conductivies of the nanocomposites.