

High-Yield Synthesis of Nanohybrid Shish-Kebab of Polyethylene on Carbon NanoFillers

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Abstract : In this study, we present a novel approach to synthesize polymer nanocomposites with nanohybrid shish-kebab architecture (NHSK). For this low-density and high density polyethylene (PE) was crystallized on various carbon nano-fillers using a novel and convenient method to prepare high-yield NHSK. Polymer crystals grew epitaxially on carbon nano-fillers using a solution crystallization method. The mixture of polymer and carbon fillers in xylene was flocculated and precipitated in ethanol to improve the product yield. Carbon nanofillers of varying diameter were also used as a nucleating template for polymer crystallization. The morphology of the prepared nanocomposites was characterized scanning electron microscopy (SEM), while differential scanning calorimetry (DSC) was used to quantify the amount of crystalline polymer. Interestingly, whatever the diameter of the carbon nanofiller is, the lamellae of PE is always perpendicular to the long axis of nanofiller. Surface area analysis was performed using BET. Our results indicated that carbon nanofillers of varying diameter can be used to effectively nucleate the crystallization of polymer. The effect of molecular weight and concentration of the polymer was discussed on the basis of chain mobility and crystallization capability of the polymer matrix. Our work shows a facile, rapid, yet high-yield production method to form polymer nanocomposites to reveal application potential of NHSK architecture.

Keywords : carbon nanotubes, polyethylene, nanohybrid shish-kebab, crystallization, morphology

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