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Self-Reinforced Polymer Composite from Postconsumer Scraps

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Self-Reinforced Polymer Composite from Postconsumer Scraps

Abstract

Nowadays, there are considerable supplies of poly(ethylene terephthalate) (PET) and polypropylene (PP) in the form of postconsumer scraps. In the plastic recycling industry, different kinds of plastics have to be separated manually before reprocessing. This greatly increases the cost of the plastic recycling. It is suggested that these wastestreams of PET and PP could be a low cost source of raw materials for forming polymer blends. This study aims to develop a PET/PP microfibrillar composite that can be processed by conventional molding methods.

In this study, the two polymers were dry mixed, compounded and then extruded through a die to produce strong micro-fibres from PET which had a higher melting temperature than PP. The blends were subsequently injection moulded below the melting point of the fibres to produce polymer fibre/polymer matrix composites. The thermal properties of the blends and of the individual polymers were studied using a differential scanning calorimeter (DSC). The effects of compositions and compounding conditions on the extrudate morphology were studied using a scanning electron microscope (SEM) and the solvent extraction technique. Mechanical testing was conducted to investigate the reinforcement of the PET fibres on PP.

Experimental results showed that high PET content, high draw ratio and low compounding temperature favored the formation of PET fibres.In the PET/PP(KM6100), PET/PP(PM6100) and PET/PP(SM6100) blends, fibres were found to predominate in

the skin layer of the extrudates. In the PET/PP(VM6100), however, most fibres existed in the core of the extrudates. Moreover, voids and cavities were formed in the composite due to different thermal contraction of PP and PET and to the volatiles given off during the extrusion process. Tensile tests showed that the strength of the composites first increased and then dropped off as the amount of PET was increased. Under suitable processing conditions, the PET/PP composite having a composition ratio of 10/90 had the highest strength, with an improvement of 20% compared with the pure PP.

評語

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