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Improvement of the chemical, thermal, mechanical and morphological properties of polyethylene terephthalate–graphene particle composites

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Abstract

The graphene powder was used as a reinforcement in polyethylene terephthalate (PET) with various weight percentages 0.1, 0.5, 1 and 2 wt%. To prepare PET/graphene powder composites, melt-mixing process was followed. The crosslinking degree between PET and functionalized graphene increased, which was indicated by carbonyl indexes (Fourier transform infrared spectra) when interfaced with PET. The results of thermal properties showed that adding 2 wt% of graphene composites improved the thermal stability, transition glass temperature T_g , crystallinity temperature point and chemical properties of PET. The results of thermal gravimetric analysis showed that the highest addition of graphene (2 wt%) into the PET slightly improves both the residue yields and thermal stability. The tensile strength of PET was highly increased with the increased loading of graphene, and the elongation was reduced, compared with PET without filler. The results of X-ray diffraction curves showed that 2% incorporation of graphene into PET has good interfacial interaction and higher intensity. The scanning electron microscopy micrographs showed a high compatibility between the pure PET and graphene composite chains.