

عنوان مقاله:

Polyurethane/Graphene Nano-Composites with Gas Barrier Properties

محل انتشار:

دهمین سمینار بین المللی علوم و تکنولوژی پلیمر (سال: 1391)

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خلاصه مقاله:

Polymeric materials have long been utilized for packaging applications. However, overwhelming demands in the marketplace have put significant pressure for material developers to pursue novel routes to manufacture low cost packaging films with greatly improved barrier properties [1]. The emergence of polymer nano-composites introduces a new opportunity to improve barrier properties of polymers. When the nano-platelets are well exfoliated, in addition to the improved barrier property, polymer nano-composites usually exhibit enhanced mechanical properties and better thermal stability [1, 2]. Graphene has a high basal plane elastic modulus, $E \approx 1 \text{ TPa}$; ultimate strength, $\sigma \sim 130 \text{ GPa}$; and room temperature charge carrier mobility, $\mu \approx 10 \text{ 000 cm}^2/\text{V s}$. Adding highly exfoliated carbon layers can significantly alter mechanical and electrical properties of polymers at extremely small loading [3]. Unlike carbon nanotubes that can provide similar mechanical and electrical benefits, these impermeable two-dimensional sheets can reduce gas permeability of host membranes [4]. In the present study, the effect of graphene on gas barrier performance of thermoplastic polyurethane (TPU)/graphene nano-composites was investigated. For this purpose, TPU was reinforced with various contents of graphene (0-2 wt.%) through solvent blending procedure. The physical and mechanical properties of the prepared nano-composites were investigated through transmission electron microscopy (TEM), wide angle X-ray reflectance diffraction (WAXD), dynamic mechanical analysis (DMA) and differential scanning calorimetry (DSC), as well as, tensile strength and gas permeability measurements.

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