

Nanocomposites and nanomaterials

Structure-properties relationship for nanocomposites based on post-consumer polymers

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In this work the nanocomposites based on post-consumer polyolefins such as low-density and high-density polyethylenes (LDPE and HDPE, respectively), polypropylene (PP), high-impact polystyrene (HIPS) and acrylonitrile butadiene styrene (ABS) and ground tire rubber (GTR) from automotive cars modified with nanostructured bitumen were developed and investigated. As it is known [1] the bitumen is a multicomponent colloidal system consists of dispersed phase of nanosized (~1.2-2.5 nm) aggregates of asphaltenes distributed in the malthenes dispersion medium. Therefore, from a modern point of view bitumen can be considered as organic nanocomposite of natural origin.

The nanocomposites were prepared by the mastication of the components in Brabender Plasticorder at 160-185 °C and 80 rpm for ≈ 15 min. The structure-property relationships of the nanocomposites prepared were investigated using TGA, DSC, DMTA and rheology analysis.

It is found that the thermal and viscoelastic properties of the composites studied are determined by the thermoplastic matrix, and the introduction of GTR lead to worsening of all basic properties. However, introduction of nanostructured bitumen into the compositions results in improved compatibility between the components, increasing thermal and mechanical characteristics of the nanocomposites studied.

1. *Gorbatovskii A.A., Rozental' D.A., Dronov S.V. Structure and Composition of Polymer-Bitumen Composites // Zhurnal Prikladnoi Khimii. – 2007. – 80, N 5. – P. 862-865.*