Modification of carbon nanofillers and characterization of respective polyolefin composites

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Polymer-carbon nanocomposites are promising future materials for multipurpose applications, including uses in energetics, electrotechnics, electronics, constructions, transport and other fields of natural economy.

Development of effective polymer-carbon nanocomposites, however, depends much on the capability of managing the structure formation during manufacturing.

Consequently the research is devoted to modification of multi-walled carbon nanotubes for achieving improved compatibility with polyolefine matrix. Ionic liquids as well as anhydride functionalities containing agents have been evaluated as potential modifiers. Attention is paid to perfection of the method of manufacturing of polymer-carbon nanocomposites. Various technological approaches, such as masterbatch, solvent and direct compounding routes are compared in respect to their effectiveness in obtaining of aforementioned polymer-carbon nanocomposites in broad range of the nanofiller concentrations (0-10 wt.%). Mechanical (tensile stress-strain characteristics as well dynamic mechanical relaxation behaviour), electrical (dielectric relaxation behaviour), thermal (including temperature stability and thermal conductivity) and surface properties (wettability) of the manufactured polyolefine matrix based nanocomposites are investigated. The influence of the factors of aggressive external environment (UV irradiation, temperature, moisture) on the characteristics of the investigated polyolefine-carbon nanocomposites is also evaluated. Change of the selected mechanical, electrical and thermal properties have been justified by respective structural and morphological investigations.

It has been shown that by introducing certain amount of the modified carbon nanofillers in the polyolefine matrix allows considerably improve mechanical, thermal and electrical performance of the investigated systems.