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Electrically conductive PTT-block-PTMO/SWCNTs+Graphene Nanoplatelets hybrid nanocomposites prepared by in situ polymerization

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Single walled Carbon Nanotubes/Graphene Nanoplatelets/PTT-*block*-PTMO hybrid nanocomposites were prepared by *in situ* polymerization**.** A remarkable synergistic effect between SWCNTs and GNPs on improving electrical conductivity, thermal and mechanical properties of nanocomposites based on segmented block copolymers was observed.
Heterogeneous structure of the PTT-*block*-PTMO allowed for a better and more uniform distribution of both types of nanoparticles and stabilized the structure in question. This enabled to observe a so-called “synergistic effect”, caused by the use of mixture of carbon nanotubes and graphene nanoplatelets, on obtaining conducting electron paths and enhancement of thermal and mechanical properties of the synthesised composites. SEM and TEM analysis of the PTT-PTMO nanocomposites displayed that SWCNT/GNP hybrid nanofillers exhibited better distribution in whole volume of polymer matrix and compatibility than SWCNTs and GNPs did individually. DSC and DMTA measurements were performed in order to ascertain the influence of mentioned carbon nanostructures on the nanoseparated phase structure of the synthesized PTT–PTMO block copolymers. By incorporating CNTs and/or graphene nanoplatelets in block copolymers the thermal stability of polymers have been enhanced and a significant shift of 24 ^{o}C towards higher temperatures for 0.5SWCNT/0.1GNP system was observed. Moreover, in the case of above mentioned hybrid a significant increase in tensile modulus (68 %) along with the typical flat plot (hybrid PTT-PTMO/0.5SWCNT+0.1GNPs exhibited the typical behavior for semiconducting samples with the conductivity of 10^{-6} S/cm), where no dependency of σ in the function of frequency was seen.

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References

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