Nanocomposites and nanomaterials

Interfacial Interactions in the Nanocomposites Based on Polyurethane and Functionalized Multi-Walled Carbonanotubes

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Via acid oxidation and reduction chemical procedures, carboxyl, phenol, lactone functional groups to be used as cross-linking sites to the matrix were generated on the MWCNT surface. The functional groups were attached to the MWCNT surface either directly through covalent bonding or by van der Waals forces only. The nanocomposites based on thermosetting polyurethane matrix and MWCNT with different functional groups on the surface were prepared and investigated. SEM and TEM analyses revealed that a good nanotube dispersion and distribution in the PU matrix were observed for the nanocomposites with ultralow contents of functionalized MWCNTs (up to 0.1%) whereas both individually separated nanotubes and their small agglomerates were presented in the matrix at higher content of nanofiller.

The pronounced dynamic heterogeneity within the PU glass transition was registered by dynamic mechanical analysis (fig.1) and creep rate spectroscopy especially at direct covalent bonding between MWCNT surface and matrix. Due to the cardinal changes in the interactions at the interface two- or threefold enhancement in mechanical properties compared with neat PU matrix, was attained in the case of MWCNTs with covalently attached functional groups.

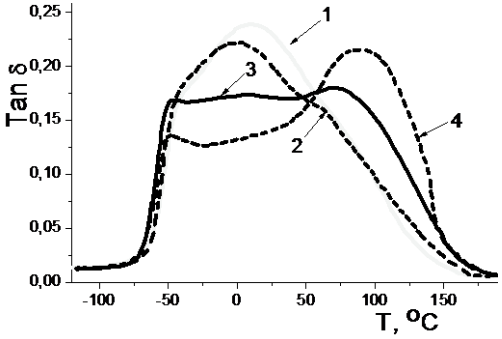

Fig.1 Temperature dependence of Tan δ in DMA measurements for neat PU(1) and nanocomposites with 0,01% (2), 0,10% (3) and 0,25% of MWCNT-ox.

Acknowledgement The work was supported by the FP7-PEOPLE-IRSES project 230790 COMPOSITUM