

Nanomaterials and nanocomposites

The influence of carbon nanotubes structure on the properties of polyurethane/carbon nanotubes nanocomposites

O.A. Kuh¹, Eu.V. Lobko², Z.O.Gagolkina², Yu.V.Yakovlev²

¹National university "Kyiv-Mohyla academy", Skovoroda Str., 2, Kyiv, 04070, Ukraine

²Department of polymer physic, Institute of Macromolecular Chemistry. Natl. Acad. of Sci. of Ukraine. Kharkivske chaussee, 48, Kyiv-02160, Ukraine.

E-mail: lobko_zhenia@i.ua

Polyurethanes (PU) are widely used as substitutes for rubber leather, adhesives, coatings, foams, as mechanically, thermally, chemically stable and hydrophobic materials that can operate in a wide range of loads and temperatures. Filling PU by carbon nanotubes (CNT) allows producing composites with electro conductive properties, improved mechanical strength and thermal stability systems.

It was investigated the influence of an amount and the structure of multi-walled carbon nanotubes (MWCNT) on the properties of polyurethane/carbon nanotubes composites. The dispersion of nanotubes was added *in situ* in polyurethane matrix in an amount of 0.1 to 5%wt. CPU synthesized through a stage prepolymer based on toluene diisocyanate and polypropylene glycol 1000 in a ratio of 2/1. The cross-linked agent is trimethylolpropane. The nanotubes with an average diameter of 25 nm, 35 nm and 30 nm (nitrogen-containing nanotubes) and length of 1-5 μm were used.

The tensile strength has been increased after adding carbon nanotubes from 4 to 14 MPa. There were no radical modifications during concentration changes and that indicates on the presence of defects in the structure of carbon nanotubes. Research of the elongation at break shows decrease of this parameter for all composites with different concentration, due to the reinforcing effect of CNT.

For composites with CNT diameter of 25 nm, 35 nm and nitrogen-containing carbon nanotubes, there were no evident increase of conductivity with the filling concentration fewer 5% (figure). That fact allows assuming that nanotubes have twisted structure and that's why large concentrations of carbon nanotubes are required in order to increase conductivity.

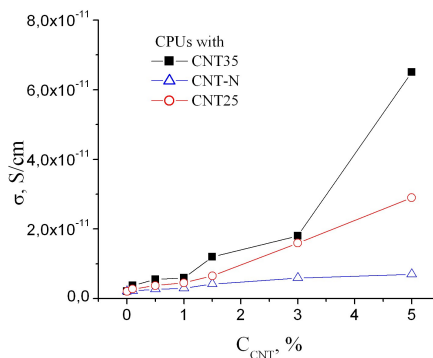


Figure. The conductivity of CPU/CNT composites.

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