

Nanocomposites and nanomaterials

Effect of Ultraviolet/Ozonolysis-Treatment of nanocarbon on the temperature and concentration dependence of the resistivity of epoxy composites.

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The paper discusses the electrical conductivity mechanisms of graphite nanoplatelets (GNPs)/epoxy nanocomposites by analysis of their temperature and concentration dependences of conductivity. Two types of the nanocomposites are compared: with UV/O₃ treatment of the filler and without. The results of experimental investigations and modelling were correlated. The content of nanocarbon filler was varied from 1 to 10 wt. %, time of UV/O₃ treatment of GNPs particles was 20 min. Low-viscosity epoxy resin Larit285 was used as the polymer matrix. Nanocomposites were prepared using usual method of ultrasonication of GNPs in polymer solution.

It was attempted to estimate the reasons of percolation threshold shift to the lower concentrations following UV/O₃ treatment of the nanocarbon filler in terms of proposed model which reveals variations in contact resistance and numbers of conductive chains for different nanocomposites. Analysis of obtained by 2- or 4-probe method experimental results for the GNPs/epoxy nanocomposites temperature dependence of conductivity have shown that a transition from predominantly “direct contact” to “tunneling” conductivity near T=150K. It was associated to the changes in such nanocomposite microparameters as the thickness of polymer layer, carrier transport features.