Nanocomposites and nanomaterials

Influence of dispersity of particles of copper iodide on the electrical properties of composites based on polychlorotrifluoroethylene

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It is known that properties of composite materials depend both on the nature of a filler, its dispersity, and concentration and on the type of interaction between the fi ller surface and the matrix. Passing to nanosize fillers makes it possible not only to markedly improve characteristics of nanocomposites at a lower degree of their filling, but also to occasionally obtain new properties unachievable with the conventional fillers and modifiers.

Cuprous iodide (CuI_m), which was synthesized from a water solution KI, $Na_2S_2O_3$ and $CuSO_4$, had a particle size of 3-7 microns. Synthesis of nanoparticles CuI_n (200 nm) was carried out in the process of sonication of an aqueous KI solution, with a gradual addition of $CuSO_4$. Diffractograms for samples were recorded on a diffractometer DRON-4-07 using CuK_α radiation of an anode with a nickel filter in the reflected beam mode and the Bragg–Brentano geometry. Our identification of the observed diffraction maximums provides evidence for the fact that in all the samples there is a copper iodide. The samples of system polychloro-trifluoroethylene (PCTFE)–CuI_m and PCTFE-CuI_n was compacted at the temperature equal to the melting point of the polymer (523 K) at a pressure of 2 MPa. The above-said studies of electrophysical properties of systems were performed with the help of a superfrequency inteferometer at the frequency range from 8 to 12 GHz and the temperature 293 K.

Reducing the dispersity of copper iodide leads to a significant increase in the values of the complex permittivity and conductivity at low and high frequencies at the content of CuI $\leq$ 0.06 vol. fractions, as well as a significant reduction in the percolation threshold of system.

Technological conditions for the synthesis of copper iodide to regulate a wide range of values of electrophysical characteristics of polymer composites due to the formation of the maximum surface of interfacial interaction between components.