

Nanocomposites and nanomaterials

Structural organization and electrophysical behavior of electroactive hybrid polymer nanocomposites doped with ionic liquids

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Electroactive hybrid polymer nanocomposites (EaHPNs) have been synthesized in the reactive mixture of organic component, which had free reactive NCO-groups, and the inorganic component with reactive OH-groups. Oligoetherurethane (UO) was macrodiisocyanate with $M_w = 4500$ and reactivity $R=0,036$ and used as organic component. The inorganic component was metal silicate (MS), which exists in the form of oligomer. The ratio of organic/inorganic components was equal to 70/30.

Two types of ionic liquids (IL), namely quaternary ammonium salts and diquaternary ammonium salts based on morpholine, were used.

Different structural organizations of EaHPNs including ion conducting phase were found depending on the doping way of ionic liquids. The doping leads to destruction of the mineral phase with the simultaneous formation of new crystalline structures due to MS/IL reactions. Contrariwise, synthesis of EaHPNs based on UO and ILs results in amorphous grain-oriented structural organization and formation of the ion conducting cluster with the DC conductivity level $\sigma_{DC} \sim 10^{-3}-10^{-4}$ S/cm, AC conductivity level $\sigma' \sim 10^{-2}-10^{-3}$ S/cm and permittivity $\epsilon' \sim 10^5-10^6$ taken at 10^3 Hz (by the results of BDS, Im and cyclic VA spectroscopy).