

ON THE TEMPERATURE DEPENDENCE OF THE THICKNESS AND STRUCTURE C₇₀/POLYSTYRENE THIN FILMS

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The investigations and application of polymer nanocomposites, consisting of different nanoparticles presented into polymer matrix, are on the rise since 1990s following a number of interesting discoveries. The researchers are interested in studying the physics that lead to the enhanced properties of these materials [1].

In this work, we are investigating the nanocomposite thin films, taking one of the most common polymers, atactic polystyrene (aPS), and the calibrated highly symmetric carbon nanoparticles, fullerenes. The system of aPS with fullerene C₆₀ has been a subject of interest for the last several years. Taking account of the recent results, we continue research in this field. Here we report the results of our investigations of the polystyrene-fullerene thin films prepared by spin-coating from toluene solutions on silicon substrates by neutron, X-ray reflectometry, and molecular dynamics simulations. A review of recently obtained results is given [2], as well as new measurements of thin films at different temperatures passing through the glass-transition range. The comparison of novel data with the data for fullerene C₆₀ (and other nanoparticles) may be important for discussion on future applications and enhancement of dispersion of nanoparticles in polymer matrix.

[1] M.A. Yaklin, P.M. Duxbury, M.E. Mackay (2008). Control of Nanoparticle Dispersion in Thin Polymer Films. *Soft Matter*. 4, 2441.

[2] T.V. Tropin, M.L. Karpets, Ye. Kosiachkin, I.V. Gapon, Yu.E. Gorshkova, V.L. Aksenov (2021). Evaluation of fullerenes C₆₀/C₇₀ layers in polystyrene thin films by neutron and X-ray reflectometry. *Fullerenes, Nanotubes and Carbon Nanostructures*. 15(4), 768-772.