

## Neutron reflectometry study of structure in thin films of polystyrene-fullerene nanocomposites

Thin polymer films have numerous technological applications in various industrial and biomedical sectors related to protective and functional coatings, non-fouling biosurfaces, biocompatibility of medical implants, separations, advanced membranes, microfluidics, sensors, devices, adhesion, lubrication and friction modification[1]. In many cases, the films can be of complex composition with different types of polymers with complex architecture and other components such as nanoparticles. Polymers in thin films and nanocomposite structures can exhibit unusual physical properties due to the geometric constraints imposed by the presence of surfaces and interfaces. Polystyrene-fullerene films present a suitable model system for investigation of these properties. Neutron reflectometry has proved to be an effective method for studying PS/C60, allowing evaluating the structural peculiarities of nanoparticles ordering in the polymer matrix [2].

In the present work, we performed neutron study of structure and glass transition in the thin films of polystyrene-fullerene C70 nanocomposite. PS/C70 and dPS/C70 solutions in toluene were spin-coated on Si (111) at 2000 rpm after filtering through 0.22 Milipore filter. Series of thin films samples with different concentration of C70 were prepared and investigated for the internal structure and glass transition.

Neutron measurements of polymer thin films in the temperature range up to 130°C were performed at the GRAINS instrument of the IBR-2, JINR. For this purpose, a special cell for samples was designed and created. Changing of the glass transition temperature has been observed and possible internal structure of films has been analyzed.

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