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Magnetic scattering of polarized neutrons on structures of reduced graphene oxide embedded in the polystyrene matrix

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The development of composite materials based on graphene, included in polymer matrices of different nature, and the study of the relationship between their structure and properties using complementary methods of research are due to several reasons. First is the search for new magnetic materials promising in spin electronics. Second, there is interest in physical processes in highly defective nanostructured carbon materials, in which, according to literature data, magnetic and superconducting effects may occur. In this study, for the first time, using the method of small-angle polarized neutron scattering (SAPNS), an assessment of the scale of arising spin correlations in reduced graphene oxide (RGO), which was preliminarily surface-modified with 3-(trimetoxysilylpropyl)methacrylate (TMSPM) and copolymerized with styrene, was made. Two-dimensional RGO structures functionalized by vinyl groups and embedded in the polystyrene matrix were measured using the SAPNS method (FRM-2, KWS-1, Garching). The SAPNS experiments showed the presence of magnetic-nuclear interference both in the modified TMSPM carbon filler and in the polystyrene/RGO composite, which indicates the presence of magnetized areas of 1000 Å scale and magnetic scattering with amplitude B≠0 in the systems under study.
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