STRUCTURAL FEATURES OF LIQUID CRYSTALLINE SUSPENSIONS OF DIAMOND NANOPARTICLES BY NEUTRON SCATTERING

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In recent years, composite systems based on nanoparticles of inorganic materials dispersed in organic matrices have been actively studied, among which anisotropic liquids, liquid crystals are particularly noteworthy. The chemical and mechanical stability of carbon nanoparticles, including nanodiamonds, fullerenes, nanotubes and graphene, makes them suitable objects for filling liquid crystals to improve their characteristics. Various forms of nanocarbon have different geometries, which therefore significantly affects the local ordering of liquid crystal molecules in different ways.

The research was aimed at studying the structural features of liquid crystals filled with diamond nanoparticles both in bulk and at interfaces in model electro-optical cells (nodes of such important devices as solar batteries, touch screens, broadband optical polarizers, *etc*.). Until now, the structure of such systems has been studied mainly by optical methods, which made it possible to achieve a micron resolution. However, for the most part, the properties of the relevant nanosystems are determined by the structure at the submicron level down to the nanoscale. Moreover, near-surface layers on the electrode/liquid crystal interfaces play an important role in the functionalization of electro-optical cells. The goal was, firstly, to study the effect of the addition of diamond nanoparticles with various concentrations on the structural properties of liquid-crystal matrices, and secondly, to compare these properties of liquid-crystalline nanodiamond suspensions in the volume and at the interfaces using neutron scattering techniques (small-angle neutron scattering and neutron reflectometry). The use of the neutron scattering in structural research is primarily justified by a significant neutron contrast of the carbon particles concerning the dispersion medium, as well as the high penetration power of neutrons.

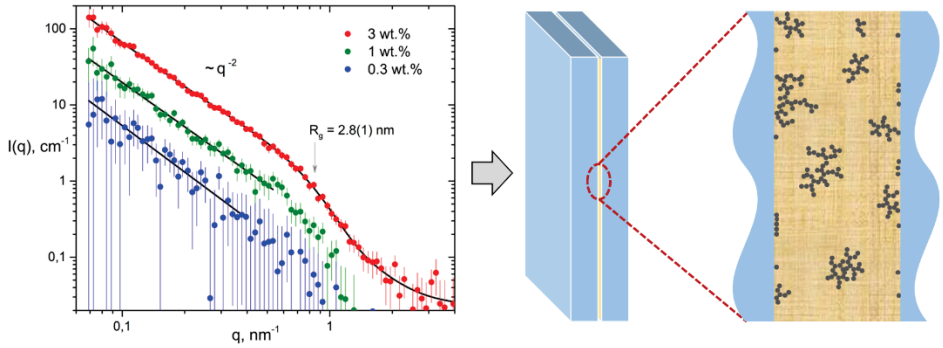

Fig. 1. Small-angle scattering data for liquid crystalline suspensions of diamond nanoparticles