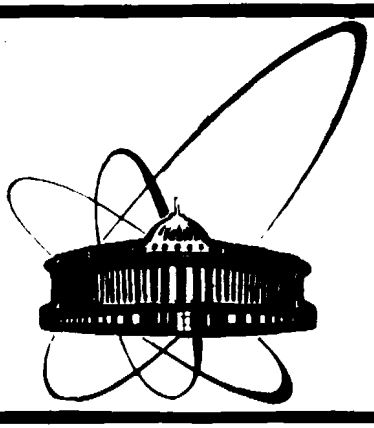

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SANS STUDY OF MOLECULAR COILS ANISOTROPY OF COMB-LIKE LIQUID CRYSTAL POLYMERS IN SMECTIC AND NEMATIC MESOPHASES

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The type of mesophase of the liquid crystalline side-chain polymers (LCP) is determined, as a rule, by a packing characters of mesogenic side groups. However, some LCP having the same structure, but different chemical nature of the main chain or different lengths of spacers have different types of mesophase. Naturally, a question arises about the main chain effect on the structures of the LCP.

The small angle neutron scattering (SANS) method in combination with the method of isomorphic replacement is, as a matter of fact, the only direct method to define the conformation of the labelled macromolecule in the medium of unlabelled ones.

Structural models of side-chain LCP in smectic and nematic mesophases, based on SANS data are proposed in papers[1,2].

According to ideas developed in [1], the main chain of the LCP macromolecule in the smectic phase divides into quasi-two-dimensional subcoils, randomly placed in the neighbouring (mainly alkyl) sublayers separated by the mesogenic (aromatic) ones. The subcoils are connected with each other by the tie segments of the main chain, accomplishing random walks through mesogenic layers. The tie segments can be considered as defects in the smectic phase.

SANS data on anisotropy macromolecules coils of LCP in the smectic phase allow one to estimate the average number of defects per macromolecule, and its formation energy. Temperature studies make it possible to give the answer to the question if the process of the defects formation in the smectic phase is of equilibrium character. And finally, of particular interest is the performance of the direct SANS investigation of the defect structure.

The measurement of the mean square of the radius of gyration projections of the anisotropic coil in nematic phase by the SANS method provides one with information on the correlation in orientations between mesogens and segments of the backbone.

We studied several samples of the comb-like LC polysiloxane with CN-containing biphenyl side groups with average polymerization degree 63 (short chain)[3,4] oriented in the magnetic field by SANS and X-ray diffraction methods. The macromolecular coil was established to have anisotropy. Unlike available experimental data for the long chains[5], the radius of gyration projections of the main chain of the LC polysiloxane are different for two concentrations of deuterated component. These results are of a preliminary character and require verification.

We propose the following:

1. To carry out precision SANS measurements of molecular chain anisotropy oriented in the magnetic field LC polysiloxanes in smectic mesophase with the main chain of different lengths (average polymerization degrees: $\langle n \rangle$ = 63 and 350) for some concentrations of a deuterated component (C (D) = 0; 25; 50; 75 and 100%).

2. To carry out the investigation of dependence of the main chain LC polysiloxane the radius of gyration projections on temperature the smectic phase exists at (t = 20° - 100°C).

3. To conduct SANS measurements over the region of reciprocal space corresponding to the value of the Kuhn segment of a quasi-two-dimensional subcell for the given LCP samples (an expected value of b = 30 - 40Å), smectic layers of which are parallel to the sample plane.

4. To perform SANS measurements in the same sample geometry as in point 3, but in the region of low transfer impulses for the samples with c(D) = 0 and 100% for the determination of the smectic layer defect structure.

5. To conduct SANS measurements of the molecular coil anisotropy oriented comb-like LC polyacrylate in the nematic phase for some concentrations of a deuterated component.

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