STRUCTURAL FEATURES OF THE LAYERS OF MACROHETEROCYCLIC COMPOUNDS OF THE PORPHYRIN TYPE ON THE SURFACE OF WATER

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One of the most important areas of scientific research in the field of nanotechnology is the development of methods for the formation and study of the structure and properties of highly organized organic thin-film systems for the production of nanomaterials, including supermolecular ones [1] based on porphyrin-type compounds [2] with desired properties. Among the most promising methods for studying the structure of such systems are methods using synchrotron X-ray radiation.

The work is devoted to studying the structural features of the layers of macroheterocyclic compounds of the porphyrin type on the surface of the water. Experimental reflectograms of layers on the water surface were obtained using synchrotron X-ray radiation at the European Synchrotron Radiation Facility (ESRF, Grenoble, France, beamline ID-10).

Analysis of the experimental data obtained by reflectometry was carried out by special mathematical processing of the experimental data using the BARD software package [3], which includes methods of multiple-scale wavelet analysis to solve the inverse problem of reflectometry [4]. Density profiles reconstructed from reflectograms and wavelet patterns of layers of unsubstituted porphyrins of similar molecular structure formed at surface pressures commonly used to obtain films on solid substrates (π 10-15 mN/m) showed that the total layer thickness corresponds to the multilayer state of compounds on the water surface. It was also revealed the presence of periodicity corresponding to the thickness of the molecules.

The obtained data confirm the results of the analysis of layer compression isotherms performed using the author's quantitative analysis method [5], according to which the layer formed at these pressures is not monolayer (as follows from the traditional analysis method), but consists of 3D nanoaggregates.

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