STUDY OF PHOSPHOLIPID LAYERS ADSORPTION ON PLANAR SOLID INTERFACES BY SPECULAR NEUTRON REFLECTOMETRY

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Studying model lipid layers is the first and important step in understanding biological membranes and their permeability to biologically active compounds. A phospholipid bilayer can be considered as a model membrane. Studies of the structure of a planar phospholipid bilayer deposited at a solid-water interface using specular neutron reflectometry have demonstrated the high efficiency of this method for both studying the structure of the phospholipid bilayer and investigating the kinetics of its formation *in situ* [1, 2]. Time-of-flight neutron reflectometry is the most effective method for such studies [3].

This report will present data from reflectometry experiments focusing on:

- the deposition of a single phospholipid bilayer,
- the potential for interaction between a phospholipid transport nanosystem (PhTNS) containing a drug and the precipitated bilayer,
- as well as the deposition of a bilayer consisting of PhTNS.

A special consideration is also given regarding the comparison of neutron experiments on the adsorption of lipids in horizontal and vertical sample geometries.

A phospholipid transport nanosystem developed at the Orekhovich Institute of Biomedical Chemistry was chosen as the target for interaction. These aggregates are relatively small in size (approximately 50 nm) and consist of soy phospholipids and maltose (in a ratio of 1:4) and may also contain a medicament. Using PhTNS as a delivery system is promising, as it leads to increased efficacy of medicinal compounds [4,5].

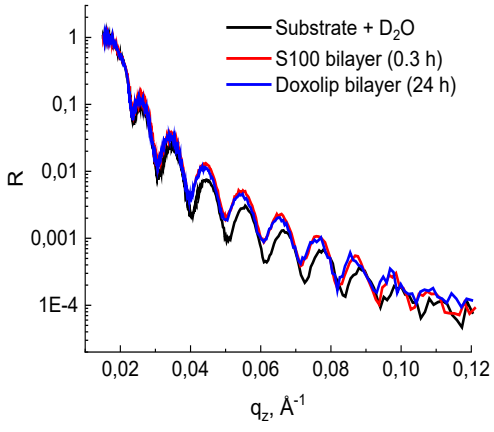

Fig.1 Reflectometric curves from substrate and soy phospholipid bilayer (S100)

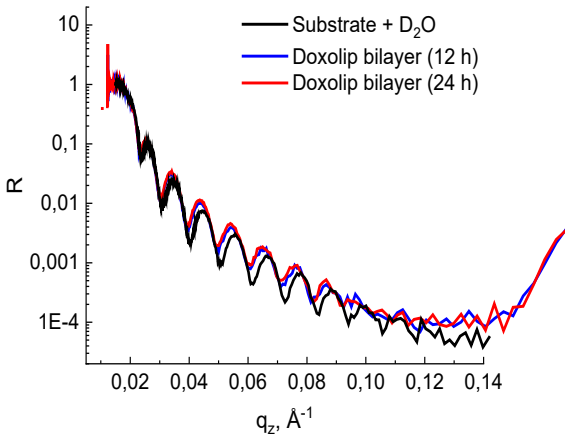

Fig.2 Reflectometric curves from precipitated PhTNS bilayer

For the experiment, we used a cell with a wash function, which allows us to remove unsettled particles from the cell and observe only the settled bilayer. A crystal with a nickel 'support'

layer was used as a substrate (Si/Ni 50 nm/Si 10 nm). Solutions were prepared in heavy water with a phospholipid concentration of 0.1%.

During the experiment, we were able to achieve a precipitated phospholipid bilayer [Fig.1]. We also precipitated the phospholipid transport systems themselves, containing the antitumor drug doxorubicin [Fig.2].

The hypothesis that PhTNS would interact with the precipitated bilayer and possibly even penetrate it was not confirmed [Fig.1]. We hypothesize that maltose, which is part of the PhTNS, may have acted as a barrier to interaction.

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