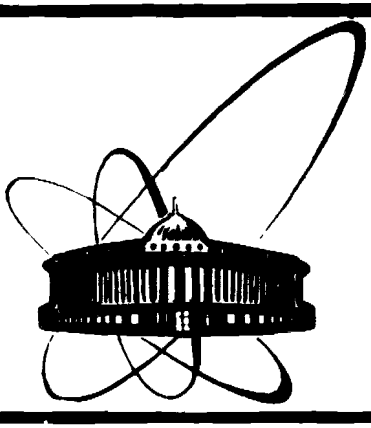

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NEUTRON DIFFRACTION STUDY OF THE ALKYL-ACIL LIPID MEMBRANE STRUCTURE

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The last several years have witnessed a thorough study of the alkyl-acyl lipid membranes[1,2]. Alkyl lipids are found, for example in plasma and organelle membranes. Their role in the life processes is not quite defined. Alkyl lipid membranes have a number of unique qualities. For instance, dihexadecylphosphatidylholin membranes, which differ primarily in chemical composition from dipalmitoylphosphatidylholin ones (methylen CH_2 groups are substituted for carbonyl C=O groups) in the gel-phase can form interdigitated phase. Moreover, in alkyl and alkyo-acil lipid systems hydration forces differ from such in acil lipid systems. According to the non-linear electrostatic hydration forces theory [3,4], these forces depend on the perpendicular component of the electric dipole moment of the lipid polar head-group, which in its turn depends on the angle between the head-group and the membrane surface; these forces also depend on the penetration depth of water into the bilayer. D16 HLL-HFR facilities can afford to carry out the precise study of the multilayer lipid membranes structure.

New information on the polar head-group conformation, the depth of water penetration into the bilayer consisting of alkyl and alkyl-acil lipids may have a decisive importance in checking the non-linear hydration forces theory.

It is planned to perform experiments on highly-oriented lipid multilayers using polished quartz slides of 25 x 25mm^2 (mosaic spread 1 - 2°), the weight of lipid in the sample is about 20 mg under relative humidity φ = 98% and at two temperatures: at room temperature and at T = 60°C. To define structural factor phases it is necessary to

measure in H_2O, D_2O and H_2O = 1:1 (m/m) vapour. It is proposed to use in the experiments membranes from two types of lipids: Dihexadecylphosphatidylholyne and 1-hexadecyl, 2-palmitoyl, phosphaticylholyne (with the usual and deuterium-labelled membranes over the region of polar-head groups of lipids).

Preliminary neutron diffraction studies on the samples with the structure resolution about 10 Å have been conducted at the TOF neutron diffractometer DN-2 at the JINR, Laboratory of Neutron Physics, Dubna.

In order to solve the problems mentioned above, the structure resolution must not be less than 5-6 Å possible in membrane structure research at D16 of the ILL-HFR, Grenoble.

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Нейтронографическое исследование структуры алкильных и алкил-ацильных липидных мембран

В работе содержится предложение исследований структуры мембран из алкильных и алкил-ацильных липидов на установке Д16 в Институте Лауэ-Ланжевена, Гренобль, Франция. Целью исследований по нейтронной дифракции является определение ориентации электрического дипольного момента полярной головы липида. Получение экспериментальной информации о конформации полярной головы, глубине проникновения воды в мембранный бислой, состоящий из алкильных и алкил-ацильных липидов, может играть решающее значение при проверке нелокальной теории гидратационных сил.

Работа выполнена в Лаборатории нейтронной физики ОИЯИ.

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Gordeliy V.I. E14-88-584

Neutron Diffraction Study of Alkyl and Alkyl-Acyl Lipid Membranes Structure

Research proposal of the structure study of membranes from alkyl and alkyl-acyl lipids at D16 setup of ILL, Grenoble, France is presented. The aim of neutron diffraction investigations is to determine the electric dipole momentum orientation of the lipid polar head. New experimental information on the polar head-group conformation, the depth of water penetration into the bilayer consisting of alkyl and alkyl-acyl lipids may have a decisive importance in checking the non linear hydratation fource theory.

The investigation has been performed at the Laboratory of Neutron Physics, JINR.

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