PROVA DE INGLÊS – CIÊNCIAS BIOLÓGICAS E AGRÁRIAS

STABILITY MONOMOLECULAR PROPERTIES OF ARCHAEAL TETRAETHER LIPIDS LAYERS ONTO SOLID SUBSTRATES

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Abstract

This paper reports the recent findings related to the stability properties of tetraether lipid layers. Organizations moleculars of chemical structure modified of Langmuir-Blodgett layers of archael tetraether lipids from the archebacterium Sulfolobus acidocaldarius on the wafer silicon substrates are investigated stable and organized. The behavior of Langmuir-Blodgett layers of chemical structure modified of archaeal tetraether lipids on the wafer silicone substrates is characterization using Differential Scanning Calorimetry (DSC) and Atomic Force Microscopy (AFM). The thermodynamics behavior and stability of Langmuir-Blodgett layers of archael tetraether lipids on the wafer silicon substrates are shown. Stability of the lipid membranes is of great importance to a number of biomedical applications, including intravenous drug delivery, biomaterials, and biosensors.

Keywords

Archaeal Tetraether Lipids, Langmuir-Blodgett Layers, Lipid Organizations

1. Introduction

Lipid membranes supported on solid substrates are considered as an importante model to mimic the natural cell membranes in fundamental studies. Supported lipid mono- and bilayers represent one of the most promising classes of model membranes. Lipid membranes have risen to prominence as an important tool for biologists and bioengineers investigating membrane phenomena. The capabilities of supported lipid

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membranes have opened the door to biotechnology applications in medicine, diagnostics, sensor systems, environmental monitoring and energy storage.

Archaeal tetraether lipids membranes could be of great value in the field of biomedicine including intravenous drug delivery, biotechnology, biosensors and membrane implant because these bolaamphiphilic tetraether lipids are the main compound in membranes of archaea into ordered structures with extraordinarily stability against chemical and microbial degradation under extreme environmental conditions such as temperatures, pH, high hydrostatic pressure, and high salt concentrations. Gliozzi et al. (1983) were displayed that neutral tetraetherlipids from the archebacterium Sulfolobus acidocaldarius form stable black lipid membranes which appeared to be organized as monolayers. Vidawati et al. (2010) were shown that stability organization molecular of Langmuir-Blodgett films chemically modified structure of archaeal tetraetherlipids. Archaeal tetraetherlipids from the archaebacterium Sulfolobus acidocaldarius formed a monomolecular lipid layer with upright standing molecules at film consistent thicknesses of approximately 5 nm determined by ellipsometry and atomic force microscopy.

In this paper, we have preparation of the chemically modified archaeal tetraether lipids in Figure 1. The membrane lipids on the wafer silicon substrate were prepared by Langmuir-Blodgett method. Chemically modified structures of archaeal tetraether lipids: GDNT, caldarchaeol-PO4, and caldarchaeol-CyCl represent model lipids at high surface pressure. It could be shown that in the monomolecular Langmuir-Blodgett film of chemically modified structure of archaeal tetraether lipids at the air-water interface molecules on the wafer silicone substrate is oriented upright standing and the horseshoe-like orientation.

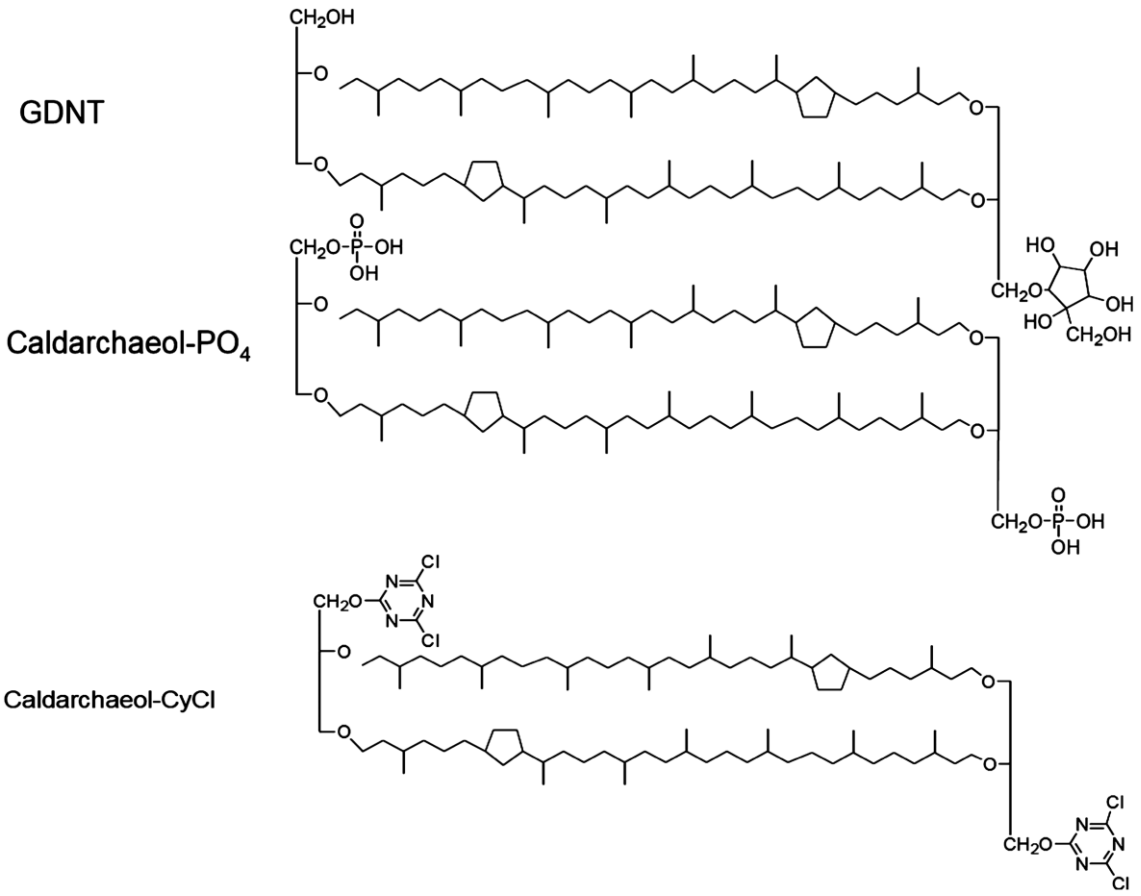

Figure 1. Chemical structure of the archaebacterial tetraether lipids: GDNT, caldarchaeol-PO4, and caldarchaeol-CyCl.

This paper reports the recent findings related to the behaviour and the stability of chemical modified structure of Langmuir-Blodgett film tetraether lipid at the air-water interfaces on the wafer silicon substrates, with special attention to the calorimetry studies which would be in line with the assumption that the archael tetraether lipids membrane has significant influence on lipid conformation, membrane thickness organization, and headgroup orientation.

2. Material and Methods

2.1. Lipid and Other Materials

Lipids from archae Sulfolobus Acidocaldarius is used for all of these experiments. A two-step chromatography method was developed, using DEAE-cellulose and silica columns, and the samples were eluted with chloroform and methanol. The head-groups (hydroxyl groups) of caldarchaeol are synthesized with PO4 in accordance with the method Bakowsky et al. The experiments were conducted with the tetraether lipids of the

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highest purity available. All other chemicals obtained from Merck (Damstadt) or Sigma (Deisenhofen) at the highest purity.

2.2. Silicon Wafers Subtrates

The wafer silicon cut into dimensions 1.0 cm . 1.0 cm. We use the Piranha method to clean the wafer silicon substrates for all experiments. The Piranha solution, which is a mixture of concentrated sulfuric acid and hydrogen peroxide(7:3 concentrated H2SO4: H2O2), is a very common oxidizing agent used to clean silicon wafers substrate

Com base no texto "**Stability Monomolecular Properties ofArchaeal Tetraether Lipids Layers onto Solid Substrates"**

Questão 01

a) Qual o objetivo do artigo? (1,0)

b) Qual a importância da estabilidade das membranas lipídicas? (1,0)

Questão 02

De acordo com o texto, responda às seguintes questões:

a) O que a pesquisa de Vidawati et al (2010) demonstraram? (1,0)

b) O que as pesquisas de Gliozzi et al mostraram? (1,0)

Questão 03

Com base no texto, responda às seguintes perguntas:

a) O que a figura 1 representa? (1,0)
b) Qual método preparou os lipídios da membrana no substrato da pastilha de silício? (1,0)

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Questão 04

a) De acordo com o texto, como ocorreu o experimento com lipídios de archae sulfolobus acidocaldarius? (2,0)

Questão 05 (2,0)

Segundo o autor, como foi utilizada o substrato da pastilha do silício no experimento?

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ESPELHO DAS RESPOSTAS

Com base no texto "**Stability Monomolecular Properties ofArchaeal Tetraether Lipids Layers onto Solid Substrates"**, responda às questões de 1 a 5.

Questão 01

a) Qual o objetivo do artigo? (1,0)

Espera-se que o (a) candidato (a) compreenda que a finalidade do artigo é relatar as recentes descobertas relacionadas às propriedades de estabilidade das camadas lipídicas do tetraéter.

b) Qual a importância da estabilidade das membranas lipídicas? (1,0)

Espera-se que o (a) candidato (a) assinale que a estabilidade das membranas lipídicas pode servir para uma série de aplicações biomédicas, incluindo drogas intravenosas, biomateriais e biossensores.

Questão 02

De acordo com o texto, responda às seguintes questões:

a) O que a pesquisa de Vidawati et al (2010) demonstraram? (1,0)

Espera-se que o (a) candidato (a) entenda que Vidawati et al. (2010) mostraram que a estabilidade da organização molecular de filmes de Langmuir-Blodgett modificou quimicamente a estrutura de tetraeterlipídios de arqueias.

b) O que as pesquisas de Gliozzi et al mostraram? (1,0)

Espera-se que o (a) candidato (a) reconheça que os pesquisadores mostraram que tetraeterlipídios neutros da arquebactéria Sulfolobus acidocaldarius formam membranas lipídicas pretas estáveis que parecem ser organizadas como monocamadas.

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Questão 03

Com base no texto, responda às seguintes perguntas:

a) O que a figura 1 representa? (1,0)

Espera-se que o (a) candidato (a) reconheça que na figura 1 representa a estrutura química dos lipídios tetraéter arquebacterianos.

b) Qual método preparou os lipídios da membrana no substrato da pastilha de silício? (1,0)

Espera-se que o (a) candidato (a) entenda que foi o método Langmuir-Blodgett.

Questão 04

a) De acordo com o texto, como ocorreu o experimento com lipídios de archae sulfolobus acidocaldarius? (2,0)

Espera-se que o (a) candidato (a) entenda que o método de cromatografia foi desenvolvido em duas etapas, usando DEAE-celulose e colunas de sílica. As amostras foram eluídas com clorofórmio e metanol. Os grupos hidroxila do caldarqueol foram sintetizados com PO4 de acordo com o método Bakowsky et al. Os experimentos foram conduzidos com os lipídeos tetraéter da mais alta pureza disponível. Todos os outros produtos químicos obtidos da Merck (Damstadt) ou Sigma (Deisenhofen) também no mais alta pureza.

Questão 05 (2,0)

Segundo o autor, como foi utilizada o substrato da pastilha do silício no experimento?

Espera-se que o (a) candidato (a) entenda que o substrato da pastilha de silício foi cortada nas dimensões 1,0 cm × 1,0 cm. Utilizou-se o método Piranha para limpar os substratos da pastilha de silício para todos os experimentos. A solução Piranha, que é uma mistura de ácido sulfúrico concentrado e peróxido de hidrogênio (7:3 concentrado H2SO4: H2O2), é um agente oxidante muito comum usado para limpeza.

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