Trends in Analytical Chemistry 79 (2016) 210-221



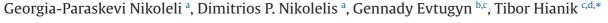
Contents lists available at ScienceDirect

Trends in Analytical Chemistry

journal homepage: www.elsevier.com/locate/trac



Advances in lipid film based biosensors





- ^b Analytical Chemistry Department of Kazan Federal University, 18 Kremlevskaya Street, Kazan, 420008, Russian Federation
- ^c OpenLab "DNA-Sensors" of Kazan Federal University, 18 Kremlevskaya Street, Kazan, 420008, Russian Federation
- ^d Faculty of Mathematics, Physics and Informatics, Comenius University, Mlynska dolina F1, 84248 Bratislava, Slovakia

ARTICLE INFO

Keywords: Supported lipid membranes Biosensor Health diagnosis Food analysis Environmental monitoring

ABSTRACT

Since first report on formation stable free standing bilayer lipid membranes (BLM) in 1962 by Mueller et al. [1] these systems became very popular in modeling various membrane processes at molecular level, such as ionic transport, ligand-receptor interactions or lipid-protein interactions. Despite of advantage of BLM in respect of variation in lipid composition and their modifications by receptors and proteins, the work with these systems was rather difficult due to their limited stability. The situation has been considerably improved by introduction of supported bilayer lipid membranes (sBLM) in 1980 by Thompson et al. [2] for possible applications in biosensors. Recent advances in stabilization of supported lipid membranes, appearance of novel nanomaterials such as carbon nanotubes has increased the number of publications on this topic. This review summarizes latest achievements in the field of biosensors utilizing sBLMs.

© 2016 Elsevier B.V. All rights reserved.

Contents

1.	Introd	luction	210
2.	Metho	ods for preparation biosensors based on sBLMs Free standing BLMs and supported BLMs	211
	2.1.	Free standing BLMs and supported BLMs	211
	2.2.	Metal supported sBLMs	212
	2.3.	sBLMs formed on a surface of glassy carbon, mica, metal oxide surfaces and on a ultrafiltration membranes	
	2.4.	Bilayers stabilized by polymerization and formed on semiconductor and carbon nanotube surfaces	213
		2.4.1. Polymer-supported bilayer lipid membranes	213
		2.4.2. Lipid films supported on carbon nanotubes	213
	2.5.	sBLMs formed on nanomaterials	
3.	Bioser	nsors based on supported lipid films and their analytical applications	214
	3.1.	Ion-selective sBLMs and water permeability channels	214
	3.2.	Enzyme biosensors	214
	3.3.	DNA biosensors	217
	3.4.	Antibody based biosensors	217
	3.5.	Affinity biosensors based on artificial and natural receptors	217
4.	Conclu	usions	219
	Ackno		220
	Refere	ences	220

1. Introduction

The biomembrane is the basic cell structure that serves not only as the barrier that separate intracellular and extracellular environ-

ment, but contain macromolecules that provide various function important for living organisms, such as transport of ions and other compounds, receptor functions, immunity response and others. The lipid environment protects the biopolymers against degradation. This extremely thin (approx. 5 nm) lipid matrix with incorporated receptors is unique biosensor developed by nature. Since discovery of model bilayer lipid membranes (BLM) by Mueller et al. [1], there have been attempts to use them in biosensing applications. However,

^{*} Corresponding author. Tel.: +421 2 60295683; Fax: +421 2 65412305. E-mail address: tibor.hianik@fmph.uniba.sk (T. Hianik).