Preparation of an electrochemical biosensor based on lipid membranes in nanoporous alumina

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Abstract

Model lipid bilayers are versatile tools to investigate the molecular processes occurring at the membrane level. Among the model membranes, substrate supported bilayers have attracted much interest because they are robust and can be investigated by powerful surface sensitive techniques such as electrochemical measurements. In a biosensor, lipid films can be used not only as a support for the biological sensing elements but also as sensing elements themselves to detect molecules that are able to alter the structure and the properties of biomembranes. In this work, we have prepared a tethered lipid membrane-based biosensor able to detect the alterations of membrane structure and fluidity. This tethered lipid membrane was prepared in a nanoporous aluminium oxide that provides a high surface area and a protective environment against dewetting. The membrane contained PEG-PE lipids as hydrating, protective and tethering agents and ubiquinone which is a redox lipophilic mediator embedded within the acyl chains of the lipid bilayer. The lipid membrane was prepared inside the pores of the nanoporous support by a PEG-triggered fusion of liposomes. This sensing system was efficient to detect the alterations of lipid membranes that are induced by the addition of a commonly used non-ionic detergent: Triton X-100.

Keywords: Biomimetic membrane; Tethered lipid bilayer; Nanoporous electrode; Electrochemistry; Atomic force microscopy; Fluorescence recovery after photobleaching

Article Outline

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