11th International Conference
on Advanced Materials
ICAM2009
Rio de Janeiro Brazil
September 20 - 25

Anchoring vesicles to form Tethered Bilayers; A facile approach to model cell membrane

H. Basit[(1)], A. Van Der Heyden[(1)] and P. Labbé[(1)*].

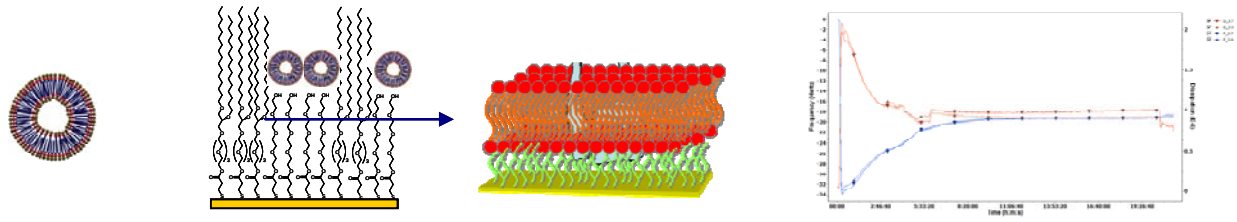
(1) Laboratoire Ingénierie et Interactions Biomoléculaires (I2BM), Département de Chimie Moléculaire, DCM UMR CNRS 5250, Université Joseph Fourier, BP 53, 38041, Grenoble cedex 09, France. Pierre.Labbe@ujf-grenoble.fr

Abstract – Lipid bilayers which are Tethered/Suspended on a solid support (gold surface) have been designed on the principle of self assembly. In this context, the gold surface was first modified with a mixture of alkane thiol and a PEG-thiol. These Self Assembled Monolayers were characterized using techniques such a QCM-D, Ellipsometry, contact angle, and Cyclic voltammetry. The fusion of POPC vesicles on these modified surfaces to form the Bilayer were then followed by QCM-D, SPR and AFM. It was observed that the PEG-thiol was necessary to fix the vesicles onto the surface whereas the alkane thiol was necessary for the fusion of the vesicles. The simplicity of preparation of such tethered Bilayer systems makes them a feasible model mimick for insertion of membrane proteins.

Interest in designing supramolecular assemblies capable of mimicking biological functions are on the surge since the past several yeras. In particular, studying cytoplasmic cell membranes has been of interest because of the myriads of functions they present, such as mediating the transport of ions and metabolites[1, 2], cell-cell interaction, and signal transduction by transmembrane proteins[3, 4]. However, mimicking this “intelligent” supramolecular assembly while retaining its structural integrity presents a challenge to membrane chemists. Developing artificial lipid bilayers which possess an intrinsic 2-D fluidity, appears to be the closest route to the goal.

The most straight forward approach to this end is to directly attach a lipid film to a surface, however in such models the bilayer being in close proximity to the surface restricts the incorporation, mobility and thus the stability of transmembrane proteins.

Herein, we present the fabrication of a system, where lipid bilayers are suspended or tethered onto a Self Assembled Monolayer (SAM) modified support (gold). This being a two step approach requires first the assembling of thiols molecules on the surface of gold, and in the next step the fusion of vesicles on this monolayer to give a Tethered/Suspended Lipid Bilayer. The fusion of vesicles however, was observed to be governed by the properties of the SAM, and this trend is dicussed in detail here.



References

(1) Hille, B., *Ionic channels of excitable membranes*. ed.; Sinauer Accociates Inc.: 1992; 'Vol.' 2nd edn, p.
(2) Becucci, L. M., M. R.; Naumann, R.; Guidelli, R. *J. Am. Chem. Soc.* **2005,** 127, 13316–13323.
(3) Sackman, E. *Science* **1996,** 271, 43–48.
(4) Tien, H. T. *Adv. Mater* **1990,** 2, 316–318.