Model Membrane Developments – SAM Approach to Supported Bilayers

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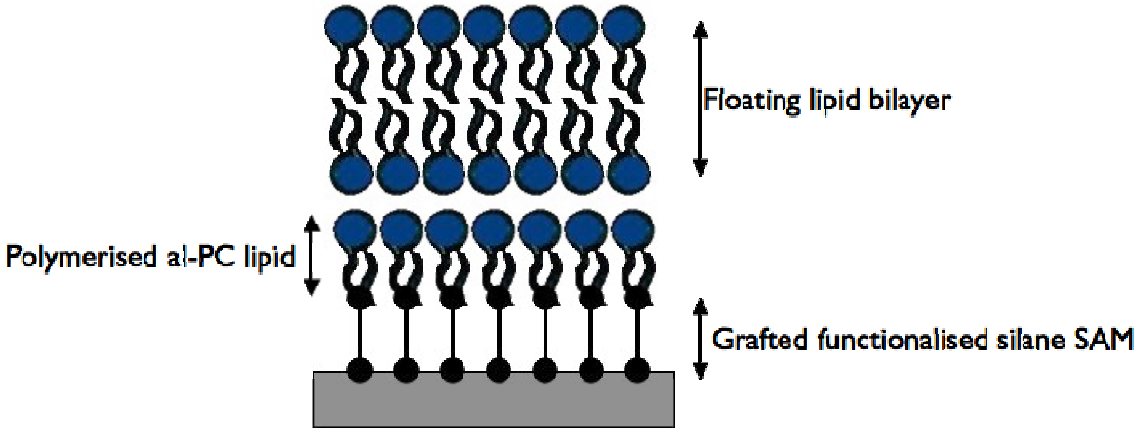
Model phospholipid bilayers are vital in the study of biological membranes, particularly in the development of nanomedicines and next generation drug delivery systems. Presented here is a new approach to fabricating floating bilayers on a chemically grafted lipid layer which has been characterised with a 30 Å hydration layer between the two, allowing the model bilayer to exhibit a realistic degree of fluidity. The grafted substrate is readily reusable after multiple ultrasound cleans, permitting the rapid deposition of new bilayers and giving this technique a significant advantage over other supported bilayer methods.



A complementary Brewster Angle Microscopy technique has been developed to visualise these floating lipid bilayers at the solid-liquid interface. This provides a simple new approach to characterising the in-plane membrane structure prior to conventional structural studies using neutron reflection. When used in conjunction with a novel new automatic levelling Langmuir-Schaeffer dipping trough, it has allowed the characterisation of complex mixed membranes made up of charged, unsaturated and asymmetric lipid distributions.

This new model approach to biomembranes has been applied to many problems, including the study of drug delivery vectors, general anaesthetics and in resolving the nature of lipid flip-flop. Ongoing work is moving towards the incorporation of membrane proteins and looking to further our understanding of lipid rafting.

References

1. Hughes A.V. et al., Floating Lipid Bilayers Deposited on Chemically Grafted Phosphatidylcholine Surfaces, *Langmuir*, 24 (5), 1989-2000 (2008).