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Stability and Applications of Model Membranes

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Biological cell membranes are a critical component of all living organisms. The cell membrane is a semi-permeable lipid bilayer controlling movement of ions and other molecules from one of the cell side to the other, and is primarily made up of amphiphilic lipid molecules.

Our research group has previously developed a model system whereby a lipid bilayer is tethered to a solid supporting structure. The resulting tethered-bilayer lipid membranes (tBLMs) are highly stable in aqueous solution and the tethering region provides a reservoir under the bilayer to allow protein incorporation and minimise bilayer/substrate interactions. In the presence of an aqueous solution tBLMs have been shown to be stable for periods as long as multiple weeks with only minor degradation.

This project is focused on understanding the effects that drying a model membrane out can have on its structure. This work is important for better understanding the water retention properties of tBLMs in order to determine their suitability for use in biosensing, where they may not be able to be completely submerged in solution, and whether additional protective coatings may be necessary to improve retention. Similar work has already been performed on other model systems such as black lipid membranes, but only tentatively in the field of tBLMs.

Electrochemical impedance spectroscopy (EIS) has been used to model changes in membrane structure through the rehydration process as well as the resulting functionality, with neutron reflectometry approved to be performed in future to determine more layer-specific effects.

Level of Expertise

Student

Presenter Gender

Man

Pronouns

He/Him

Which facility did you use for your research

Australian Centre for Neutron Scattering

Students Only - Are you interested in AINSE student funding

No

Do you wish to take part in the Student Poster Slam

No

Condition of submission

Yes

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