

X-Ray Synchrotron Studies of Biomembrane - Protein Interactions at Air-Liquid Interfaces

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In nature, lipid membranes perform many living cell functions from selective transport and recognition to simple sequestration. They generally consist of a single phospholipid bilayer or in special cases, such as the lung surfactants, a single monolayer. In the cases discussed here, the lipid membrane will be approximated as a single lipid layer at the air-liquid interface, a surfactant Langmuir layer.

Several surface-sensitive scattering techniques have been developed for probing the structure of such ultra-thin, molecular 2-D arrays of surfactants. These include X-ray reflectometry and in-plane grazing incidence diffraction. Both are particularly challenging to study due to the required horizontality of the sample.

I will illustrate the use of X-ray surface scattering methods to characterize the structures of several types of model membranes. The properties of these soft-condensed, ultra-thin layers are of general interest to a wide scientific audience working in the fields of chemistry and biology since they are relevant to such important areas as bio-mineralization, biosensors, advanced drug delivery systems, and protein-membrane interactions.