

N5 spectrometer demonstration

Shear-Alignable Free-Standing Biomembranes

Mu-Ping Nieh and Norbert Kučerka

Biomimetic lipid membranes are the common substrates for hosting membrane proteins whose native structures can be resolved as they associate with the biomembranes.

Instead of using flat substrates (e.g. Si wafers), which are not physiologically relevant, here a shear-alignable freely-standing biomembranes in solutions, providing a more physiologically relevant condition for the structural study of membrane proteins are illustrated in Figure 1.



In this demonstration we will

1. Introduce to you the basic configuration of elastic diffraction experiment and optical components such as neutron filter, monochromator, collimation, sample stage and detector.
2. Illustrate how to obtain the d-spacing of biomembranes in solutions through the $\psi - \phi$ diffraction and the analysis the Bragg peaks.
3. Explain how to attain the alignability of biomembranes through a “rocking curve” (Figure 2).
4. Explain why neutrons are the best probe in this study based on their unique properties.

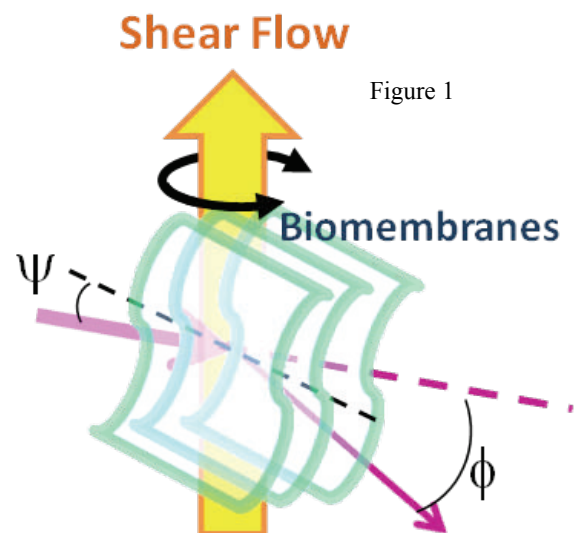


Figure 1

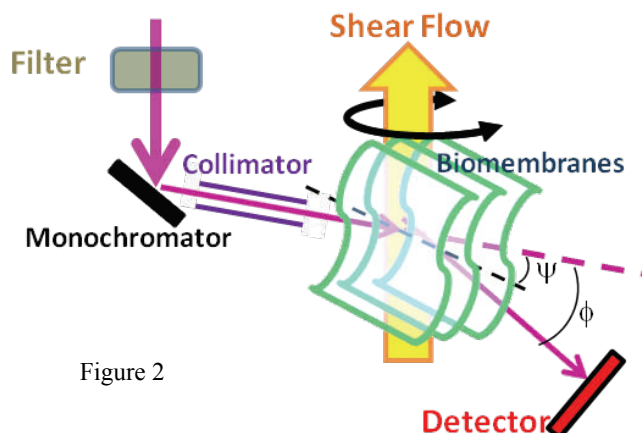


Figure 2

Figure 2. The experimental setup for conducting “rocking curve” measurements, where the neutrons (in pink) are first filtered and then selected by a monochromator crystal for a specific wavelength. The detector angle, ϕ , will be fixed at the Bragg’s reflection and the scattered intensity will be monitored as the sample angle, ψ varies around the Bragg condition. The degree of membrane alignment can be obtained based on the rocking curve.