Biomembrane Structure Probed by the Lamellar X-ray Diffraction and the Small Angle X-ray Scattering at NSRRC

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The biomembrane structure has long been an interesting issue in life science. Various techniques, including X-ray diffraction, small-angle scattering and circular dichroism, have often been introduced in revealing biomembrane structures under various temperature and relative humidity environments as well as interactions with proteins. In this study, the lamellar X-ray diffraction (LXD) and small-angle X-ray scattering (SAXS) are used to determine the membrane structures. Temperature- and humidity- dependent LXD experiments for a multilamellar membrane on a plane substrate were conducted with 12keV photons of the beamline BL13A at the National Synchrotron Radiation Research Center (NSRRC). The electron density profile and the thickness of membrane are extracted from the data reduction. Furthermore, temperature-dependent SAXS experiments for unilamellar vesicles in an aqueous solution were measured with 10.5keV photon of the BL17B3 beamline, NSRRC. Combining model fitting and SAXS data, the membrane thickness of vesicles in solution has been determined. The temperature and lipid composition effects on the membrane thickness are also discussed in this report.