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Visualizing X-ray Beam Damage of a Langmuir Monolayer via GIXD and Brewster Angle Microscopy B. LIN, S. DANAUSKAS, Y. ISHITSUKA, M. RATAJCZAK, K.Y.C. LEE, J. GEBHARDT, D. SCHULTZ, M. MERON, U. of Chicago — The extent and form of radioactive beam damage from high brilliance x-ray sources has been debated among researchers who study biological membranes. It has been shown that radiation damage increases during x-ray measurements as a function of time. However, this damage has not been optically observed on the micrometer scale for lipid membranes. Here we report the observation on the effect of radiation on a lipid monolayer of DMPS (1,2-Dimyristoyl-sn-Glycero-3-[Phospho-L-Serine]) with grazing incident x-ray diffraction in conjunction with *in situ* Brewster Angle Microscopy (BAM). The measurements were done in an oxygenated atmosphere, at a surface pressure of 25 mN/m and at room temperature. Under these conditions the monolayer is fully condensed, and the GIXD measurement shows a single first order diffraction peak. When the surface pressure is held constant, the GIXD peak height decreases over time. In addition, the BAM shows patches of lowered refractive index for the monolayer, indicating that these areas no longer contain lipids in the condensed phase. When the surface area is held constant, irradiation of the monolayer leads to a dramatic change in surface morphology as part of the condensed phase of the monolayer becomes disordered.

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