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In-situ x-ray scattering and Brewster-angle microscopy studies of 2D streptavidin crystals bound to a lipid monolayer at the solution/vapor interface SUNTAO WANG, LIN YANG, BENJAMIN OCKO, MASAFUMI FUKUTO, Brookhaven National Laboratory — Adsorption and two-dimensional (2D) crystallization of soluble protein streptavidin on a biotinylated lipid monolayer at an aqueous solution/vapor interface have been studied using *in-situ* x-ray and optical methods. For a given subphase and lipid condition, surface-normal and in-plane structures at molecular length scales were elucidated via synchrotron x-ray reflectivity (XR) and grazing-incidence diffraction (GID) measurements, respectively, at the solution/vapor interface. For GID, CCD was used for fast data collection while a microfocusing mirror was used to enhance the lateral resolution by reducing the illuminated footprint area. The 2D crystalline structures thus revealed were correlated with the morphologies of growing 2D crystal domains observed optically by carrying out Brewster-angle microscopy (BAM) under exactly the same lipid, protein, and subphase conditions. The results show that at high salt concentration (0.5 M NaCl) and moderate biotin surface density (130 or 650 $Å^2$/biotin), streptavidin nearly always forms 2D crystals, but both the unit cell structures and the crystal domain shapes are different at low, intermediate and high subphase pH values (3.2, 5.5, and 8.2).

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