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Electrostatic 2D assembly of bionanoparticles on a cationic lipid monolayer. SUMIT KEWALRAMANI, SUNTAO WANG, MASAFUMI FUKUTO, LIN YANG, Brookhaven National Laboratory, ZHONGWEI NIU, GIANG NGUYEN, QIAN WANG, University of South Carolina — We present a grazing-incidence small-angle X-ray scattering (GISAXS) study on 2D assembly of cowpea mosaic virus (CPMV) under a mixed cationic-zwitterionic ($DMTAP^+$-DMPC) lipid monolayer at the air-water interface. The inter-particle and particle-lipid electrostatic interactions were varied by controlling the subphase pH and the membrane charge density. GISAXS data show that 2D crystals of CPMV are formed above a threshold membrane charge density and only in a narrow pH range just above CPMV's isoelectric point, where the charge on CPMV is expected to be weakly negative. The particle density for the 2D crystals is similar to that for the densest lattice plane in the 3D crystals of CPMV. The results show that the 2D crystallization is achieved in the part of the phase space where the electrostatic interactions are expected to maximize the adsorption of CPMV onto the lipid membrane. This electrostatics-based strategy for controlling interfacial nanoscale assembly should be generally applicable to other nanoparticles.

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