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Mesoscopic Membrane Morphology Regulated by Molecular Crystallization CHEUK-YUI LEUNG, LIAM PALMER, BAO FU QIAO, SUMIT KEWALRAMANI, RASTKO SKNEPNEK, CHRISTINA NEWCOMB, MEGAN GREENFIELD, GRAZIANO VERNIZZI, SAMUEL STUPP, MICHAEL BEDZYK, MONICA OLVERA DE LA CRUZ, Northwestern University — A grand challenge in self-assembly of multi-component systems is to control the crystal symmetries and the resulting geometries of co-assembled molecular structures. We generate here crystalline ionic bilayers in a large variety of geometries, which resemble unusual cellular shell shapes, by mixing +3 and -1 ionic amphiphiles. To structurally characterize the co-assembly from the mesoscopic to nanometer scale, we combine electron microscopy with small and wide angle x-ray scattering. We use pH to control the degree of ionization of the amphiphiles and hence their intermolecular electrostatic interactions. At low and high pH, closed faceted vesicles with 2D hexagonal molecular arrangements were observed, while at intermediate pH ribbons with rectangular-C packing of the amphiphiles were observed. Thus pH acts as a switch to control the morphology of the ionic bilayers via transitions in the crystalline lattice. This work promotes the design of nanocontainers for various applications and improves our understanding of the origin of polyhedral shells in nature.

Cheuk-Yui Leung
Northwestern University

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