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Electrostatics-driven assembly of uni-lamellar catanionic facetted vesicles CHEUK-YUI LEUNG, LIAM PALMER, SUMIT KEWALRAMANI, RASTKO SKNEPNEK, GRAZIANO VERNIZZI, MEGAN GREENFIELD, SAMUEL STUPP, MICHAEL BEDZYK, MONICA OLVERA DE LA CRUZ, Northwestern University — Nature utilizes shape to generate function. Organelle and halophilic bacteria wall envelopes, for example, adopt various polyhedral shapes to compartmentalize matter. The origin of these shapes is unknown. A large variety of shell geometries, either fully faceted polyhedra or mixed Janus-like vesicles with faceted and curved domains that resemble cellular shells can be generated by coassembling water-insoluble anionic (–1) amphiphiles with high valence cationic (+2 and +3) amphiphiles. Electron microscopy, X-ray scattering, theory and simulations demonstrate that the resulting faceted ionic shells are crystalline, and stable at high salt concentrations. The crystallization of the co-assembled single tail amphiphiles is induced by ionic correlations, and modified by the solution pH. This work promotes the design of faceted shapes for various applications and improves our understanding of the origin of polyhedral shells in nature.

Cheuk Yui Leung
Northwestern University

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