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Hierarchical assembly of peptoid nanosheets catalyzed by an air-water interface THOMAS HAXTON, Lawrence Berkeley National Laboratory, BABAK SANII, Keck Science Department, GLORIA OLIVIER, RANJAN MANNIGE, CAROLINE PROULX, ANDREW CHO, RONALD ZUCKERMANN, STEPHEN WHITELAM, Lawrence Berkeley National Laboratory — Peptoids are synthetic analogs of peptides created by moving sidechains from the alpha carbon to the nitrogen. Removing backbone hydrogen bonding and chirality allows for assembly of planar structures driven by sidechain interactions. For instance, when exposed to and subsequently compressed at an air-water interface, amphiphilic peptoids adsorb into monolayers, reversibly compress, and finally collapse into free-floating bilayer nanosheets. We use X-ray spectroscopy, coarse-grained modeling, and analytic theory to investigate the mechanisms for structure formation and catalytic activity at the air-water interface. We find that affinity for the air-water interface and neighboring polymers lowers the free energy barrier for nanosheet formation, creates substantial in-plane order in the monolayer phase, and open voids amenable to further adsorption. The resulting monolayer exhibits residue-scale in-plane order conserved and augmented by inter-leaf order during collapse into bilayers.

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