Abstract Submitted
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Ordering by collapse: Two-dimensional crystallization of hydrophobic dimers by folding Langmuir monolayers[1] DAVID VAKNIN, Ames Laboratory, Iowa State Univerisity, WEI BU, Ames Laboratory, Iowa State Univerisity, ALEX TRAVESSET , Ames Laboratory, Iowa State Univerisity — Synchrotron X-ray studies of arachidic-acid monolayers compressed to the collapse region, beyond their densely packed molecular area, reveal that the resulting structures are stable and exhibit a surprising degree of order. Different structures, depending on whether the monolayer is spread on pure water or on $CaCl_2$ solutions, are identified. On pure water the collapsed monolayer forms a stable crystalline trilayer, with acyl-chain packing practically identical to the 3D crystal structure of fatty acids. For monolayers spread on Ca^{2+} solutions, the collapse regime consists of an inverted bilayer with the hydrophobic tails in contact with the water surface and the calcium ions bridging the polar heads. The inverted bilayer structure possesses a well ordered crystalline slab of calcium-oxalate-monohydrate intercalated between two acyl-chains. We discuss the implications of our findings to recent reports on dewetting of water near hydrophobic surfaces, on the formation of super-lattice structures by ions beneath a monolayer, and the relevance to certain biological processes.

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