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"Self-assembly of Interfacially Confined Sheet Forming Peptides"

Periodically sequenced peptides can be confined to interfaces and assembled into patterns that present chemical functionalities with exceptional spatial precision. The role of dynamics during the assembly of these peptides appears to be very important for inorganic nucleation and growth. Our work applies periodically sequenced sheet-forming peptides at interfaces to explore the dynamics of assembly. The peptide molecules are rationally designed to have amphiphilic properties and a propensity for sheet-like secondary structure. These designed peptides are deposited at the air-water interface to explore the dynamics of self-assembly and investigate their 2D order. To characterize the phase behavior, we apply Langmuir Blodgett techniques and Brewster angle microscopy. Thermodynamic analysis of structure formation with increasing pressure allows us to understand the nature of self-assembly with iterative changes in the peptide sequence. Additionally, we look at the dynamics of the self-assembled state, where the organic phase switches between short- and long-range order as a function of surface pressure. This model system allows us to explore our underlying hypothesis that the time scale of the confined peptide phase-transitions defines the length-scale of the crystalline phase. This is in contrast to a system that starts with a well- ordered preformed template that defines the mineral phase. We have shown that our model peptides can effectively be used to control the polycrystallinity in gold by controlling the surface pressure and diffusive time scales at the interface.