Deposition of Non-Templated Cubic Colloidal Crystals

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Convective deposition of monosized nanoparticles or microspheres on a substrate utilizes an evaporation-driven flow in a thin film formed across the advancing substrate. Confinement in the thin film results in capillary interactions that order particles into hexagonally arranged monolayers with varying domain size. In thicker thin films, random hexagonally packed crystals form through convection steering identified by Brewer et al., *Langmuir*, 2008. In recent work, we have extended the ability to deposit well-ordered hexagonal monolayers by adding lateral vibration in the direction of deposition. This vibration enhances the order parameter, the deposition rate, and enables coatings on relatively hydrophobic surfaces. In this talk, we introduce the discovery of utilizing this process to form *FCC* crystals from monosized colloids without templating the substrate nor changing the physical and chemical properties of the suspension. Relatively large domains of 3-12 layers cover as much as 50% of the substrate and the orientation of the FCC domains in the polycrystalline layer have a strong orientation relative to the flow direction. While the mechanism is poorly understood, these results are robust across silica and polystyrene particles in size and deposited on substrates such as glass, polystyrene, and PDMS.