Confined assembly of "soft" colloids in micropost arrays

Shu Yang*
Department of Materials Science and Engineering, University of Pennsylvania
(shuyang@seas.upenn.edu*)

The natural close-packing of sunflower seeds leads to so called phyllotactic growth, forming spirals both to the left and right while encoding the Fibonacci sequence and the Golden Ratio. In a physical confinement, interfacial forces, structural frustration, symmetry breaking, and entropy change can play dominant roles in determining molecular organization. Here, we investigate the soft and dynamic interactions of electrostatically stabilized silica colloids (500 nm-1 ㎛ in diameter), which are dispersed in crosslinkable monomers and confined in cylindrical micropost arrays (diameter of 1 -2 microns, height of 4-8 microns). Confocal and SEM images show that colloids are "living" in the channels before curing the monomers; the number of colloids per post, their assembly morphology (e.g. stacked 1D vs. zigzag 2D vs. helical 3D structures), and the disorder to order transition were highly dependent on the colloidal filling volume fraction, ratio of channel diameter/particle diameter, channel aspect ratio, and dielectric constant of monomers. Experiments will be compared with theoretical understanding of hard and soft colloidal assemblies.