Self-assembly of Nanorods into Diverse Monolayer Phases via Co-crystallization of Excess Surface Ligands

김다흰, 이도창†
KAIST
(dclee@kaist.ac.kr†)

In this presentation, we describe 2-dimensional diverse phases of colloidal nanorods in monolayer thickness through control of surface ligands, which generates a large scaled superstructure. Although nanorod has been received much attention due to their anisotropic characteristics alike liquid crystals, self-organization of nanorods into delicate phases could not be achieved. However, in our work, the nanorod assembly configuration can be freely determined from side-by-side to end-to-end by changing surface environment. For elaborate surface control, ligands with long alkyl chains, which stabilize surface of nanorods, are partially exchanged into ligands with short alkyl chains. It makes space where excess ligands can interdigitate with existing ligands via hydrophobic interaction, exposing hydrophilic functional groups outwards. By the extent of interdigitation of excess surface ligands, lyophobicity of nanorods to nonpolar solvent is controlled, thereby forming diverse monolayer phases at the air/liquid interface. All of assembled superstructures are homogeneously distributed and highly ordered in large-length-scale without coffee-ring phenomena, which have often been barrier factors in the most film devices. Overall, we suggest a simple approach for making diverse phases of nanorods, which contain vertical array, smectic assembly, network, in equilibrium.