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DNA-induced 2D-to-1D Phase Transition of Nanoparticle Assemblies at Liquid-Vapor Interface[1] SUNITA SRIVASTAVA, DMYTRO NYKYPANCHUK, Center for Functional Nanomaterials, Brookhaven National Laboratory, MASAFUMI FUKUTO, Condensed Matter Physics and Materials Science Department, Brookhaven National Laboratory, OLEG GANG, Center for Functional Nanomaterials, Brookhaven National Laboratory — We have investigated the structure formation and development for two-dimensional assembly of DNA functionalized nanoparticles at liquid-vapor interface. The adsorption of negatively charged DNA-coated particle to the interface was triggered by a positively charged lipid layer. A normal and in-plane structure of the nanoparticle monolayer were probed using in-situ surface scattering methods, x-ray reflectivity and grazing incidence small angle x-ray scattering. We observed the formation of the hexagonally closed packed (HCP) 2D lattice of nanoparticles due to a combination of electrostatic surface-to-particle attraction and interparticle repulsion. Upon an onset of DNA hybridization between particles the phase transition from HCP order to 1D crystalline structure was observed. The control on the interparticle spacing and monolayer confinement were also examined by changing a salt concentration. Our studies demonstrate novel mechanism for transition from ordered 2D to ordered 1D structure due to the domination of DNA-induced attraction over an electrostatic repulsion and open a route for nano-structure manipulations at the interfaces.

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Sumit Srivastava
Center for Functional Nanomaterials, Brookhaven National Laboratory

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