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Multiscale self-assembly of DNA-functionalized nanoparticles and cationic phospholipids[1] SUNITA SRIVASTAVA, DMYTRO NYKYPANCHUK, OLEG GANG, Brookhaven National Laboratory — Cationic phospholipids (CLs) when mixed with oppositely charged biomolecules exhibit rich structural diversity including lamellar, inverted hexagonal, honeycomb and rectangular columnar phases. Our study explores how CLs can be used to control the organization of nanoparticles (NP) and their ligands on molecular and nano scales by tuning lipid composition. We utilized a synchrotron-based x-ray scattering to probe in-situ electrostatic assembly of double stranded (ds) DNA-functionalized nanoparticles with cationic phospholipids. The assembly of the DNA-NP and CLs is driven by attraction between negatively charged ds-DNA and positively charged CLs. We investigated the role of DNA length, lipid charge density and charge ratio on structural behavior of the assembly. Interplay of electrostatic interaction and curvature effects results in hierarchical organizations in which DNA-NP and CLs exhibit lamellar and hexagonal phases at different length scales.

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