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Shape-induced phase transformation in nanoparticle assemblies[1]

YUGANG ZHANG, FANG LU, DANIEL VAN DER LELIE, OLEG GANG, Brookhaven National Laboratory, Upton, NY — The role of interparticle interactions in a behavior of condensed phases of spherical objects is remaining in a focal point of diverse studies of micro- and nanoscale colloid systems. At the same time, recent advances in a fabrication of well-defined nanoscale materials allow for an exploration of geometrical effects in systems containing objects with non-spherical shapes. Herein, we report a phase evolution of 3D assemblies of ligand coated cube-like palladium nanoparticles. We observed a continuous phase transformation of particles assemblies from a simple cubic phase to a face-centered cubic rich phase with an increase of capping ligand thickness. The details of structural evolution were revealed using small angle x-ray scattering and electron microscopy methods. The observed phase transformation is attributed to an evolution of particle's shape from cube to quasi-sphere geometry, which was effectively regulated by amount of a ligand adsorbed on a particle surface.

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