METAL–METAL BINAY NANOPARTICLE SUPERLATTICES: QUASICRYSTALLINE STRUCTURE INDUCED BY EITHER LIGAND EXCHANGE OR MAGNETIC INTERACTIONS

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Co/Ag and Ag/Ag binary nanoparticle superlattices are engineered. The nanoparticle size ratio is the dominating factor in the formation of binary nanoparticle superlattices as well as the relative ratio concentration of small and large nanoparticles, and the deposition temperature. With same coating agent for both nanoparticle size, the crystalline structures predicted by the hard sphere agree with the experiments. By opposition, when large and small nanocrystals are coated with two different ligands, while keeping all other experimental conditions unchanged, the final binary structures markedly change and various structures with lower packing densities, such as Cu₃Au, CaB₆ and quasicrystals, are observed. Ligand exchange mechanism affects the formation of binary systems composed of two sets of nanocrystals with different sizes and bearing two different coating agents. With Co/Ag nanocrystals the type of crystallinity the structure is governed by Co-Co magnetic interactions.

Keywords: binary nanoparticles superlattice, quasi crystalline structure, ligand exchange

References:

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