

Evaporation Driven Self-Organization of Bidisperse Colloidal Particles

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Colloidal cluster have been studied as a building block for unusual lattices of colloidal crystals, which cannot be achieved by self-assembly of spherical colloids. For the preparation of colloidal clusters, emulsion droplets have been employed as confining geometry of monodisperse colloidal particles. In this case, most of the clusters composed by less than 12 particles have shown to have the minimal second moment structures. In this work, we introduced the bidisperse colloidal particles of different surface properties onto the droplet interface to create the colloidal clusters which have enhanced complexity compared with the minimal second moment structures. To modify the surface property of particles, we treated silica particles with silane coupling agents such as dichloro-dimethylsilane (DCDMS) and octadecyltrimethoxysilane (OTMOS). In addition, we applied dye molecules on the surface of silica spheres to distinguish silica spheres from those which have different surface properties. In oil-in-water emulsion, as the volatile oil droplets containing bidisperse colloids were evaporated, the colloids formed aggregates in the aqueous medium.