

[22-S03]

2D Self-assembled Arrays of Co-nanoparticles on Solid Surfaces

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The 2D-arrays of 8.0 nm Co-nanoparticles capped with sodium bis(2-ethylhexyl) sulfosuccinate (NaAOT) formed on H-passivated Si(111) and highly oriented pyrolytic graphite (HOPG) have been studied using ultra-high vacuum scanning tunneling microscopy (UHV-STM) and atomic force microscopy (AFM). When a drop of colloidal Co-nanoparticle solution on H-passivated Si(111) is dropped, the Co-nanoparticles form small aggregates on H-passivated Si(111), whereas, by the spin-coating method, they are arranged into mono-dispersed nanoparticle arrays. Also, the Co-nanoparticle arrays are prepared on HOPG. By the dropping method, the close-packed 2D-array of nanoparticles is observed on HOPG. However, by the spin-coating method, the Co-nanoparticles form wire-like ordered arrays oriented into one-direction on HOPG. The formation of Co-nanoparticle arrays on both surfaces will be explained in terms of van der Waals interaction between the nanoparticle and the substrate.