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Monolayer Assembly of Co-nanoparticle on Si by Covalent Linkage

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OH-passivated Si(111) surface functionalized by wet-chemical method and 10 nm Co-nanoparticle capped with Br-terminated surfactant were prepared by chemical methodology, respectively. Therefore, 2-dimensional self-assembled Co-nanoparticle monolayer on Si(111) was formed by reflux reaction in toluene solvent. This formation of self-assembled Co-nanoparticle monolayer was studied using field emission scanning electron microscopy (FE-SEM), X-ray photoelectron microscopy (XPS). FE-SEM images revealed that Co-nanoparticles assembled with short-range order in a local domain and formed partial hexagonal close packing on Si(111). Besides monolayer domains, some dilayer or multilayer domains of Co-nanoparticles were formed on Si(111) depends on reaction conditions. XPS spectra confirmed that Co-nanoparticles bonded on OH-passivated Si(111) surface by strong chemical covalent linkages via Si-O-C bonding.