Synthesis and Catalytic Properties of thin layer oxide encapsulated hybrid nanocatalysts

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Surfactants or organic capping agents or polymer, which are widely used in colloidal chemistry to stabilize nanoparticles at mild conditions, decompose at high temperatures, leaving the uncapped nanoparticles unprotected against sintering and deactivation. In order to prevent the sintering effect, many efforts have been devoted to design thermally stable hybrid nanocatalyst. Here, we present hybrid nanocatalysts with ultrathin oxide encapsulation (SiO2/M/TiO2, M=Pt, Rh, Ru) synthesized by an simple surface-modified chemical processes. Specifically, Metal nanoparticles capped with citrate are successfully assembled on the functionalized SiO2 via electrostatic interaction and finally an ultrathin layer of the metal-oxide coated on surface. TEM studies confirmed that metal nanoparticles are uniformly dispersed and distributed throughout the surface. In particular, to investigate the presence of a thin layer as well as uniformity of the coating, energy-dispersive X-ray spectroscopy (EDS) line mapping were investigated. The metal nanoparticles are still well exposed to outer surface, being enabled for catalytic activity. The catalytic activity has been evaluated for high temperature CO oxidation reaction.