Synthesis and Catalytic Properties of Pt/Silica Hybrid Nanocatalysts Encapsulated with Ultrathin Oxide

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Surfactants or organic capping agents or polymer, which are widely used in colloidal chemistry to stabilize nanoparticles, decompose at high temperatures, leaving the uncapped nanoparticles unprotected against sintering. In order to prevent the sintering effect, many efforts have been devoted to design thermally stable nanocatalyst. Here, we present metal-oxide hybrid nanocatalysts with ultrathin oxide encapsulation (SiO_2/Pt/Metaloxide, Metaloxide=TiO_2,Nb_2O_5,Ta_2O_5,CeO_2) synthesized by an surface-modified chemical processes. First, SiO_2 colloidal sphere have been synthesized followed by amine functionalization. Metal nanoparticles are assembled on the SiO_2 via electrostatic interaction and finally an ultrathin layer of metal-oxide coated on surface. TEM studies confirmed that metal nanoparticles are uniformly dispersed and distributed throughout the surface of SiO_2 with an ultrathin layer of metal-oxide. In particular, to investigate the presence of a thin layer of metal-oxide as well as uniformity of the coating, EDS line mapping for constituent elements were investigated.