Merging of Colloid Science, Heterogeneous Catalysis and Nanoelectronics by Novel Model Catalysts

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The colloid nanoparticles with stabilizing agents permit us to control the size, composition, and shape that are required to precisely quantify chemical influences.In this talk, I will address the role of surface segregation, surface oxide and metal-oxide interfaces on various nanoparticle catalysts including Pt, Rh, Ru nanoparticles and Pt/Rh bimetallic nanoparticles with control of composition and sizes. Oxidation states of Rh and Ru nanoparticles have been engineered via various surface treatment. The changes that occurred during UV-ozone surface treatment were characterized with X-ray photoelectron spectroscopy, which showed that the oxidation state increased after surface treatment. Turnover rates of CO oxidation of Ru and Rh nanoparticles appear to have correlation with stability of the surface oxide layer surrounding the metal core. Oxidation states of Ru nanoparticles were monitored under CO oxidation condition with ambient pressure X-ray photoelectron spectroscopy.