Bridging Surface Study to Nanoparticle Catalysts by Shape Modulation

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Development of synthesis techniques for nanoparticles with various shapes and compositions has impacted in many areas including catalysis, optics, medical applications, etc. We have particularly interested in exploring shape effect of metallic or metal oxide nanoparticles on their catalytic properties. Different shapes produce corresponding surface crystalline structure. For example, for fcc (face-centered cubic) metals such as platinum, gold, and palladium, cubic shape generates (100) surface with square atomic arrangement, while octahedral or tetrahedral shape produces (111) surface with hexagonal atomic arrangement. These different surface structures affect the activity, selectivity, and even long-term stability of the catalytic nanoparticles, which already have been predicted in single crystalline surface studies for decades. By using nano synthetic technology, we can bridge the surface studies to more practical nanoparticle system, potentially resulting in enhanced catalytic properties.