Structural Modulation and Model Catalytic Properties of Rare Earth / Noble Metal Nanocatalysts

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Rare earth / noble metal nanocatalysts have been heavily used in the fields of environmental remediation, new energy, and petroleum industry and so on. Fine modulation of the active structures of the nanocatalysts at atomic level can not only improve their catalytic performances, but also promises a robust approach towards achieving a high-efficiency utilization of the atoms of both recatants and catalysts during the catalytic process and even new catalytic nanomaterials. So far, how to construct well-defined nanostructures of the catalytic materials through developing controllable liquid synthetic methods and reveal the molecular catalytic mechanisms using some model catalytic reactions in order to obtain strategies for optimizing their catalytic performances has remained a grand challenge. This talk will deal with our current progress in the studies on structural modulation and model catalytic properties of rare earth / noble metal nanocatalysts. In recent years, our group has developed some controlled synthetic methods to prepare well-defined nanostructures of ceria, platinum and ruthenium based materials, so as to comprehend their molecular catalytic mechanism and structure-function relationships for some important model catalytic reactions (e.g., CO oxidation and methanol electro-oxidation), in combination with the first principles calculations.[1-8] We discovered that a significantly enhanced catalytic performance could be achieved by tuning the effects of doping, alloying and faceting in those nanostructured materials during the model catalytic reactions.

Keywords： Rare earths; Noble Metals; Nanocatalysis; Controlled synthesis; Model Catalytic Reactivities

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