

Nanocatalysis for Energy

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Energy is not only the driver for improving the quality of human life but also critical to our survival. To power the planet for a better future, both effective use of energy and development of sustainable and clean energy resources are required. Catalysis, the essential technology for accelerating desired chemical transformations, is key to realizing environmentally friendly and economically feasible processes for converting energy carriers to directly usable energy. To realize the full potential of catalysis for energy applications a detailed understanding of the atomic and nanoscale structure of the catalysts and their dynamic reactions has to be well understood. Understanding mechanisms and dynamics of catalyzed reactions is a grand challenge of catalysis for energy applications. Design and synthesis of nanocatalysts with desired structures is another grand challenge. At the Center for Nanoscience of the UM-St. Louis, we are utilizing the recent progress in synthesizing novel nanostructures to develop nanocatalysts to address both of these challenges in order to develop clean alternative energy resources. We will discuss practical examples on the development of nanostructured bimetallic electrocatalysts for low temperature fuel cell applications, novel nanocatalysts for hydrogen production by onboard reforming of alcohols, and nanostructured photo-catalysts for producing hydrogen by photo-catalytic water splitting processes.