Metal-Oxide Interactions in Heterogeneous Catalytic Conversion: Insights from Models to Powder Catalysts

Sanjaya D. Senanayake
Chemistry Department
Brookhaven National Laboratory
Upton NY, 11973

Several important heterogeneous catalytic processes rely on interactions between metals and their oxide support in catalysts (ie.$Cu/ZnO/Al_2O_3$) for the optimum production of fuels, including H_2 (Water-gas shift (WGS), Steam Reforming) and alcohol (CO_2 hydrogenation). Often the reaction performance relies on several factors including the catalyst composition, geometry and structure of the catalyst to impart effects on selectivity and activity. The ability to control this structure-function relationship offers great incentives to achieve improved chemical conversion and is employed in the rational design of new catalyst materials. I will discuss the importance of this specific interface between metal and oxide, its interaction in three separate configurations including in 1. conventional supported catalysts (M-CeOx), 2. the inverse catalyst (CeO_x-M) and 3. mixed metal oxide catalysts (M-CeO_x-TiO_2). I will draw on studies performed on both well-defined planar model systems and high surface area powder catalysts using *in situ* experimental methods to probe the atomic structure/morphology of catalysts, the chemical nature, metal-support interactions and to elucidate mechanisms under reaction conditions.