

Surface And Redox Characterization Of New Nanostructured $\text{ZrO}_2@\text{CeO}_2$ Systems With Potential Catalytic Applications

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Abstract

Ceria-zirconia mixed oxides are widely used as catalysts and catalytic supports. Nevertheless, due to economic and geo-strategic concerns, reducing and optimizing the lanthanide content in these formulations while preserving or even improving their excellent redox and catalytic properties has become a challenge for current research. In this context, the design of core@shell nanostructures arises as a feasible alternative to achieve the aforesaid goal. In the present work, a new nanostructured $\text{ZrO}_2@\text{CeO}_2$ system based on spherical and mesoporous zirconia cores coated by a well-dispersed nanometer-thick ceria layer has been prepared by a novel synthetic approach in 2 different steps: (1) synthesis of the zirconia cores by a sol-gel method and (2) coating with a thin ceria shell by controlled chemical precipitation. The resulting nanocomposite was characterized by several techniques, which clearly reveal its perfect core@shell nanostructure and enhanced reducibility as compared with pure ceria.

Keywords

Ceria-Zirconia; Core@Shell Nanostructure; Redox Characterization; Surface Characterization