Design of highly dispersed nanosized ceria-based composite oxides for catalytic applications

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Nanosized ceria (CeO_2) and ceria-based composite oxides are the topic of numerous investigations recently owing to their broad range of applications in catalysis, materials science and fuel cell technology [1a]. Ceria is one of the most important components in three-way catalysts (TWC) and fluid-cracking catalysts (FCC). Other significant applications of ceria-based materials include deNO_x catalysis, removal of soot from diesel engine exhaust and elimination of volatile organic compounds (VOC) from waste streams. However, pure ceria as a catalyst is poorly thermostable and undergoes rapid sintering under high temperature applications thereby loosing its crucial oxygen storage capacity (OSC) [1b]. Replacement of cerium ions by cations of different size and/or charge modifies ionic mobility inside the lattice resulting in the formation of defective fluorite structured solid solutions. Such modifications in the defect structure of ceria confer new properties to the catalyst, such as better resistance to sintering and high catalytic activity for various reactions. Some of these aspects with respect to highly dispersed nanosized ceria-based nanocomposite oxide over various supports will be discussed in this presentation.