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VABILO NA PREGLOV KOLOKVIJ / INVITATION TO THE PREGL COLLOQUIUM

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Velika predavalnica Kemijskega inštituta / Lecture Hall at the National Institute of Chemistry; Hajdrihova 19, Ljubljana

APPLICATION OF MATERIALS BASED ON CERIA IN CATALYSIS FOR ENERGY AND ENVIRONMENT

Ceria and other rare earth oxides have been largely used in the last decade in catalyst formulations for a variety of processes in the area of both chemicals (refining of petrochemical products) and environment (especially dedicated to treatment of exhaust gases from mobile sources). The most significant of the rare earth elements are certainly lanthanum and cerium, their oxides being used as structural and electronic promoters in several applications in the field of environmental catalysis. Lanthana is well known as surface area stabilizer of supports based on alumina and zirconia, while the major benefit of cerium oxide is to increase oxygen storage/release properties of three-way catalyst formulations, often in combination with ZrO_2 and other rare earth oxides like.

There are also several emerging applications or processes, for which ceria is currently being actively investigated. More specifically, cerium oxide is used in several applications for the energy sector as a key component in catalyst materials for reforming, partial oxidation and water gas shift reaction. Other energy-related uses are in the fuel cell technology, where CeO_2 and other rare earth materials are fundamental components to reduce the operating temperature of solid oxide fuel cells.

As a contribution to these areas, we have been investigating in the last few years a number of issues concerning the preparation and characterization of mixed transition metal/precious metals rare earth oxides and vanadates as active materials for applications in catalytic and soot combustion and for use in catalytic reactions involving elimination of NO_x from diesel engine emissions [1-8]. Some of these issues will be reviewed here, with a special focus on the catalytic properties and on their fundamental structural/morphological characteristics.

[1] M. Casanova et al., Improved high temperature stability of NH_3-SCR catalysts based on rare earth vanadates supported on $TiO_2WO_3SiO_2$, Catal. Today, 184 (2012) 227-236.
[2] E. Aneggi et al., On the role of lattice/surface oxygen in ceria–zirconia catalysts for diesel soot combustion, Catal. Today, 181 (2012) 108-115.
[3] K. Schermanz et al., Catalyst composition for selective catalytic reduction of exhaust gases, WO2011/127505.
[4] A. Gayen et al., Activity, durability and microstructural characterization of ex-nitrate and ex-chloride $Pt/Ce_{0.56}Zr_{0.44}O_2$ catalysts for low temperature water gas shift reaction, J. Catal., 270 (2010) 285-298.
[5] S. Colussi et al., Structure and morphology of Pd/Al_2O_3 and $Pd/CeO_2/Al_2O_3$ combustion catalysts in Pd-PdO transformation hysteresis, Appl. Catal. A, 390 (2010) 1-10.
[6] S. Colussi et al., Study of sulfur poisoning on Pd/Al_2O_3 and $Pd/CeO_2/Al_2O_3$ methane combustion catalysts, Catal. Today, 155 (2010) 59-65.
[7] F. Amoroso et al., An efficient and reusable catalyst based on Pd/CeO_2 for the room temperature aerobic Suzuki-Miyaura reaction in water/ethanol, J. Mol. Catal. A, 315 (2010) 197-204.
[8] S. Colussi et al., Nanofaceted Pd-O sites in Pd-Ce surface superstructures: Enhanced activity in catalytic combustion of methane, Angewandte Chemie Int. Ed., 48 (2009) 8481-8484.

Vljudno vabljeni! / Kindly invited!

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