

2<sup>nd</sup> International Conference and Exhibition on  
**Materials Science and Chemistry**  
July 13-14, 2017 Berlin, Germany

### New cerium and praseodymium-based oxides as redox catalysts

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In the last 20 years, intense efforts deal with the environmental impact decrease of the automotive exhaust gases. Highly severe regulations led to the design of new materials for CO, unburned hydrocarbons oxidation and for the NO<sub>x</sub> reduction from industrial sources, especially from diesel automotive engines. Diesel oxidation catalysts (DOC) have then been developed to oxidize CO, hydrocarbons and NO, in order to reach the NO<sub>2</sub>/NO<sub>x</sub> ratios suitable for the downstream system of selective catalytic reduction (SCR) of NO<sub>x</sub> by ammonia. Therefore, rare-earth oxides (REO) involving mixed valence states such as Ce<sup>4+</sup>/Ce<sup>3+</sup>, Pr<sup>4+</sup>/Pr<sup>3+</sup> and Tb<sup>4+</sup>/Tb<sup>3+</sup> exhibit the best acid, basic and redox properties (with high oxygen availability and mobility) to fulfill the requirements of enhanced catalysts. Considering that Tb<sub>4</sub>O<sub>7</sub> is too expensive for extended industrial applications, the objective is to finely tune the composition, structure, texture, oxygen mobility and storage of Ce/Pr/Zr based oxides to design effective and robust catalysts for DOC and SCR. Recent studies have evidenced that a fine tuning of some chemical CeO<sub>2</sub>-ZrO<sub>2</sub>-Pr<sub>6</sub>O<sub>11</sub> compositions can stabilize Pr<sup>4+</sup>/Pr<sup>3+</sup> rates associated with oxygen vacancies leading to high OSC, oxygen mobility, thermal stability up to 1400°C and surface areas varying between 80 and 40 m<sup>2</sup>/g at 700°C. Moreover, preliminary catalytic results for DOC application revealed outstanding properties without any PGM (platinum group metal). Neutron and X-ray diffraction analysis during the redox cycle reveal the occurrence of oxygen vacancies ordering depending on the Pr<sup>4+</sup>/Pr<sup>3+</sup> and Ce<sup>4+</sup>/Ce<sup>3+</sup> atomic ratios determined by magnetic measurements and XANES analysis.

#### Biography

Alain Demourgues has worked at ICMCB as a Research Fellow. He became the Research Director at CNRS in 2008. He received IBM-France Award in 1993 (Young Scientist in Materials Science) and SFC (Société Française de Chimie) Award in 2003 (Solid State Chemistry division). He is a Consulting Scientist since 1998 at Rhodia-Solvay in the field of solid state chemistry, redox and opto-electronic properties. He has 128 publications (h-index 23) and 9 patents. He was the In-charge of 20 industrial contracts and has directed 19 PhD students.

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