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## Ceria–zirconia-copper oxide catalysts for CO removal from H<sub>2</sub>-rich streams under PEMFC operating conditions

Aldo Talon<sup>\*</sup>, Elisa Moretti<sup>a</sup>, Loretta Storaro<sup>a</sup>, Martina Marchiori<sup>a</sup>, Pietro Riello<sup>a</sup>, Antonia Infantes-Molina<sup>b</sup>, Enrique Rodríguez Castellón<sup>b</sup>

<sup>a</sup> Department of Molecular Sciences and Nanosystems, University Ca' Foscari of Venice, Via Torino 155/B, 30172 Venice – Italy.

<sup>b</sup> Department of Inorganic Chemistry, Crystallography and Mineralogy, University of Málaga, Campus de Teatinos, E-29071 Málaga – Spain.

\*Corresponding author: [aldair@unive.it](mailto:aldair@unive.it).

### Summary

On-board hydrogen production from hydrocarbons or alcohols has been proposed as the most efficient process to obtain hydrogen for feeding proton-exchange membrane fuel cells (PEMFCs). However, the gas produced after reforming and water gas-shift processes still presents in most cases a relatively high CO concentration, that disallows efficient handling of the fuel by the Pt anode usually employed in the PEMFCs. Preferential oxidation of carbon monoxide (CO-PROX) has been recognized as one of the most straightforward and cost-effective methods to achieve acceptable CO concentrations (<10 ppm). Among different types of catalysts for the PROX reaction, those based on Ce-Zr-Cu oxides<sup>1-3</sup> have shown promising properties in terms of activity, selectivity and resistance to CO<sub>2</sub> and H<sub>2</sub>O.

In this work, a series of Ce–Zr–Cu mixed oxide systems, with different atomic ratios among cations, were prepared by slow co-precipitation with the aim to investigate the influence of the presence of very small amounts of zirconium on the performances of these three-component catalysts.

The activity of these materials was evaluated in the CO preferential oxidation in hydrogen-rich gas stream (1.2% CO, 1.2% O<sub>2</sub>, 50% H<sub>2</sub>, He balance) in the absence and presence of CO<sub>2</sub> and H<sub>2</sub>O, in the 40-190°C temperature range. Correlations between catalytic activity and physico-chemical properties of the materials were made by X-ray Powder Diffraction (XRPD), N<sub>2</sub> physisorption, Temperature-Programmed Reduction (H<sub>2</sub>-TPR), X-ray Photoelectron Spectroscopy (XPS).

**Keywords:** *Hydrogen; CO preferential oxidation; copper; ceria-zirconia.*

### References

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