

Ce-Zr-Cu mixed oxide with layered morphology for the on-board H₂ purification by preferential CO oxidation

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1. Introduction

The on-board production of H₂ for polymer membrane fuel cells (PEMFCs) is usually accomplished by a multi-step process that includes catalytic reforming of bio-alcohols and preferential oxidation of CO (CO-PROX) at low temperature. Among different types of catalysts for the PROX reaction, those based on Cu-Ce oxides [1,2] have shown promising properties in terms of activity, selectivity and resistance to CO₂ and H₂O.

2. Results and Discussion

In this work, a series of Ce-Zr-Cu oxide catalysts prepared by a very slow co-precipitation method and heat-treated at different temperatures was examined with the aim to determine the effect of the thermal treatment on the active species. Correlations between catalytic activity and physico-chemical properties of the materials were made by using X-ray Powder Diffraction (XRPD), Temperature-Programmed Reduction (H₂-TPR), X-ray Photoelectron Spectroscopy (XPS) and *operando* X-ray Absorption Near Edge Structure (XANES), besides the CO-PROX as test reaction. The combination of H₂-TPR, XPS and XANES techniques has proved a powerful tool to study the redox features of the samples and suggested that a different thermal treatment can significantly affect the catalytic behavior, enhancing or diminishing the accessibility of catalytically active species.

3. References

- [1] E. Moretti, L. Storaro, A. Talon, P. Riello, R. Frattini, M. Lenarda – *Micropor. Mesopor. Mater.*, 116 (2008) 575.
- [2] M. Lenarda, E. Moretti, L. Storaro, A. Talon, R. Moreno-Tost, E. Rodríguez-Castellón, A. Jiménez-López, *Catal. Letters* 129 (2009) 323.