The effects of microwave-assisted hydrothermal treatment on NiO-YSZ-CeO_2 composite

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In the present study the general properties of NiO-ZrO_2:8mol%Y_2O_3-CeO_2 (60:20:20 wt.%) nanopowders were investigated aiming at the development of catalytic active anodes for solid oxide fuel cells (SOFCs) operating on ethanol. Nickel and cerium nitrates were used as precursors materials for a reverse hydroxide co-precipitation method, using ammonium hydroxide as precipitate agent. Commercial YSZ was added in the precipitate solution, and mixed with the precipitate during synthesis process. The resultant suspension was treated by a microwave-assisted hydrothermal (MWH) system. For comparison with the MWH, both as-prepared samples and samples heat treated in a conventional oven were prepared. The obtained composites were characterized by simultaneous thermogravimetry / differential thermal analysis (TG/DTA), X-ray diffraction (XRD), dilatometry, and energy dispersive X-ray spectroscopy (EDS). The electrical and catalytic properties were studied by impedance spectroscopy and ethanol decomposition analysis. Preliminary results evidenced that samples treated by MWH exhibit improved catalytic properties and slightly high conductivity at temperatures above 500 ºC.

Keywords: composite, microwave-assisted hydrothermal, solid oxide fuel cell

Acknowledgments: CNPq, IPEN-CNEN/SP.