

Accepted Manuscript

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PII: S0167-577X(16)31972-3

DOI: <http://dx.doi.org/10.1016/j.matlet.2016.12.087>

Reference: MBLBLUE 21899

To appear in: *Materials Letters*

Received Date: 27 September 2016

Revised Date: 15 December 2016

Accepted Date: 28 December 2016

Please cite this article as: A.R.O. Sousa, A.J.M. Araujo, G.S. Souza, J.P.F. Grilo, F.J.A. Loureiro, D.P. Fagg, D.A. Macedo, Electrochemical assessment of one-step Cu-CGO cermets under hydrogen and biogas fuels, *Materials Letters* (2016), doi: <http://dx.doi.org/10.1016/j.matlet.2016.12.087>

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Electrochemical assessment of one-step Cu-CGO cermets under hydrogen and biogas fuels

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Abstract

CuO-Ce_{0.9}Gd_{0.1}O_{1.95} (CuO-CGO) nanocomposite powders obtained by *in situ* one-step synthesis were used to prepare Cu-CGO cermet anodes for solid oxide fuel cells (SOFCs). The effects of the CuO content (varying from 40 to 60 wt.%) on the lattice parameter and crystallite size of CuO and CGO phases were investigated by X-ray diffraction (XRD) with Rietveld refinement of the XRD data. CuO-CGO composites were screen-printed on both faces of ceria-based substrates, fired at 1150 °C, reduced to Cu-CGO cermets, and electrochemically characterized by impedance spectroscopy in hydrogen and synthetic biogas atmospheres. One-step Cu-CGO anodes with 40 wt.% CuO showed area specific resistances of 0.15 ohm.cm² (in hydrogen) and 2.30 ohm.cm² (in biogas) at 800 °C. The anode performance is deteriorated by increasing the CuO content to 60 wt.%.

Keywords: Composite materials; electrical properties; impedance spectroscopy, Cu-CGO, SOFC anode.

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