XIX Simpósio Brasileiro de Eletroquímica e Eletroanalítica
01 a 05 de abril de 2013
Campos do Jordão Convention Center – Campos do Jordão - SP

Ethanol electro-oxidation in alkaline medium using Pd/C, Au/C and PdAu/C electrocatalysts prepared by electron beam irradiation

Adriana Napoleão Geraldes[1,*], Dionisio Furtunato da Silva[2], Eddy Segura Pino[2], Júlio César Martins da Silva[1], Rodrigo Fernando Brambilla de Souza[2], Estevam Vitório Spinacé[2], Almir Oliveira Neto[2], Marcelo Linardi[2], Mauro Coelho dos Santos[1]

[1] LEMN – CCNH - Universidade Federal do ABC, Rua Santa Adélia, 166-Santo André, SP.
[2] Instituto de Pesquisas Energéticas e Nucleares, Av. Prof. Lineu Prestes, 2242-São Paulo, SP.

Abstract:
Environmental problems and the world growing demand for energy has mobilized the scientific community in finding of clean and renewable energy sources [1]. In this context, fuel cells appear as appropriate technology for generating electricity through alcohols electro-oxidation [2]. Carbon-supported Pd, Au and bimetallic PdAu (Pd:Au 90:10, 50:50 and 30:70 atomic ratios) electrocatalysts were prepared using electron beam irradiation [3]. The obtained materials were characterized by EDX, XRD, TEM. In -situ ATR-FTIR analysis was used to study oxidation pathways and the catalytic activities for the materials toward ethanol electro-oxidation were evaluated in alkaline medium in a single alkaline direct ethanol fuel cell (ADEFC) in a range temperature 50 to 90 °C. The best performance was obtained at 85 °C (Fig.1). X-ray diffractograms of PdAu/C electrocatalysts showed the presence of Pd-rich (fcc) and Au-rich (fcc) phases.

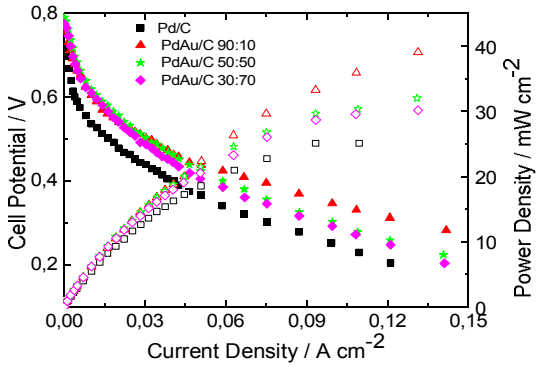

Fig. 1. Polarizations and power density curves of a 5 cm^2 ADEFC.

TEM analysis showed nanoparticles with average sizes in the range of 3-5 nm and broad size distributions. Cyclic voltammetry and chronoamperometry experiments showed that PdAu/C electrocatalysts with Pd:Au 90:10 and 50:50 atomic ratios demonstrated superior activity toward ethanol electro-oxidation at room temperature. *In situ* ATR-FTIR spectroscopy measurements have shown that ethanol electro-oxidation route is dependent on the catalyst composition leading to different reaction products.

Acknowledgments:
CNPq, Fapesp (10/16511-6), INCT Energia e Meio Ambiente (573.783/2008-0) and Capes.

References:
[1] G. Hoogers, Fuel Cell Technology Handbook, CRC Press, 2002.
[2] A. O. Neto, R. R. Dias, M. M. Tusi, M. Linardi and E. V. Spinacé, J. Power Sources 166 (2007) 87.
[3] D. F. Silva, A. N. Geraldes, E. S. Pino, A. O. Neto, M. Linardi, E. V. Spinacé, Journal of Nanomaterials 2012 (2012) 1-6.

* **main author e-mail:** drinager@ig.com.br