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Activation of Methane on PdZn/C Electrocatalysts in an Acidic Electrolyte at Low Temperatures

J. Nandenha[1,], I.H.F. Nagahama[1,2], J.Y. Yamashita[1,2], E.H. Fontes[1], J.M.S. Ayoub[1], R.F.B. de Souza[1], F.C. Fonseca[1], A.O. Neto[1,*]*

[1] Instituto de Pesquisas Energéticas e Nucleares, IPEN/CNEN-SP, Av. Prof. Lineu Prestes, 2242 Cidade Universitária, CEP 05508-000, São Paulo, SP, Brazil
[2] Faculdades Osvaldo Cruz, FOC, Rua Brigadeiro Galvão, 540 Barra Funda, CEP 01151-000, São Paulo, SP, Brazil
[*]E-mail: neto.almir@bol.com.br

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PdZn/C electrocatalysts were prepared by sodium borohydride utilized as reducing agent for activation methane in an acidic medium at room temperature and in a proton exchange membrane fuel cell (PEMFC) at 80°C. The materials prepared were characterized by X-ray diffraction (XRD), transmission electron microscopy (TEM) and X-ray photoelectron spectroscopy (XPS). The diffractograms of the PdZn/C electrocatalysts showed only peaks associated with Pd face-centered cubic (fcc) structure. Cyclic voltammograms (CV) of all electrocatalysts after adsorption of methane shown an increment in current during the anodic scan, this effect was more pronounced for $Pd_{(70)}Zn_{(30)}$/C. In situ ATR-FTIR (Attenuated Total Reflectance-Fourier Transform Infrared) experiments was not observed the formation of intermediates adsorbed for PdZn/C electrocatalysts, this behavior indicated that the methane oxidation occurs by parallel mechanisms. Polarization curves at 80°C in PEMFC show that $Pd_{(90)}Zn_{(10)}$/C has superior performance over the other electrocatalysts in methane oxidation.

Keywords: sodium borohydride reduction process; PdZn/C electrocatalysts; methane oxidation; acidic electrolytes; polarization curves

FULL TEXT