Electro-oxidation of ethanol in acid medium using carbon-supported PtRh nanoparticles with (100) preferential orientation

N.G. Pereira Filho, R.F.B. Souza, A.S. Ramos, R. M. Antoniassi, A. Oliveira Neto*,
E. V. Spinacé*

Instituto de Pesquisas Energéticas e Nucleares – IPEN-CNEN/SP, Av. Prof. Lineu Prestes, 2242,
Cidade Universitária, 05508-900 São Paulo – SP, Brazil

*E-mail: espinace@yahoo.com.br; aolivei@ipen.br

Received: 25 October 2021 / Accepted: 6 October 2021 / Published: 10 November 2021

Carbon-supported PtRh nanoparticles with preferential (100) orientation was prepared by an alcohol-reduction process using KBr as a shape directing agent. The electrocatalysts were characterized by EDX (energy-dispersive X-ray analysis), XRD (X-ray diffraction) and TEM (Transmission electron microscopy). The electro-oxidation of ethanol was studied by cyclic voltammetry and chronoamperometry at room temperature in acid medium. On-line differential mass spectrometry experiments were performed on a single cell of a direct ethanol fuel cell (DEFC) at 60 °C and the anodic effluents were analyzed by ATR-FTIR. PtRh/C (100) electrocatalyst showed cubic-like morphology and average nanoparticles size of 8 nm and provided superior DEFC performance (density power per Pt active area) and CO₂ selectivity compared to polycrystalline PtRh/C and commercial Pt/C electrocatalysts.

Keywords: PtRh nanoparticles; (100) preferential orientation, electrocatalysts; ethanol; fuel cell; DEFC

[FULL TEXT](#)

© 2021 The Authors. Published by ESG (www.electrochemsci.org). This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution license (<http://creativecommons.org/licenses/by/4.0/>).