Short Communication

Glancing Angle Deposited Pt Nanorod Array Electrocatalysts for Direct Ethanol Fuel Cells

Wisam J. Khudhayer^{1,*}, Ali S. Allw¹, Mohammed D. Salman², Tansel Karabacak³

¹ Department of Energy Engineering, College of Engineering / Al-Musayab, University of Babylon, Hillah 51002, IRAQ

² College of Engineering, University of ThiQar, ThiQar 64001, Iraq

³ Department of Applied Science, University of Arkansas at Little Rock, Little Rock, Arkansas 72204, USA

*E-mail: Met.Wisam.j@uobabylon.edu.iq

doi: 10.20964/2017.11.43

Received: 12 November 2015 / Accepted: 22 August 2017 / Published: 12 October 2017

The catalytic activity of vertically aligned platinum nanorod arrays for ethanol electrooxidation has been evaluated utilizing cyclic voltammetry (CV) in 0.5 M H₂SO₄ and 0.5 M ethanol electrolyte at room temperature. The Pt nanorods electrodes were grown using a magnetron sputtering glancing angle deposition (GLAD) technique at different lengths (400 ad 600 nm long). The x-ray diffraction and SEM results reveal that that Pt nanorod are well-isolated, single crystal, and mainly oriented in Pt(100) which has the highest activity for ethanol adsorption and electrooxidation. The CV results show that the forward anodic current density (I_f) to the reverse anodic peak current density (I_b) ratio is calculated to be 4.8 and 7.2 for 400 and 600 nm Pt nanorods, respectively, while it is around 2.5 for a commercial high-surface-area-supported Pt (Pt/C) catalyst. Such high ratio for Pt nanorods electrocatalysts reflects the enhanced tolerance to the accumulation of carbonaceous species; a larger quantity of intermediate carbonaceous species is converted (oxidized) to CO₂ in the forward scan compared to Pt/C, thus significantly enhancing the electrode electroactivity.

Keywords: Glancing Angle Deposition (GLAD) technique, GLAD Pt nanorod arrays electrocatalysts, Electrooxidation of Ethanol, Direct Ethanol Fuel Cells.

[FULL TEXT](#)

© 2017 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/>).