Bimetallic Nickel and Copper Supported Pt Catalyst for Ethanol Electro-Oxidation in Alkaline Solution

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doi: 10.20964/2018.02.65

Received: 20 October 2017 / Accepted: 21 November 2017 / Published: 28 December 2017

Bimetallic nickel and copper supported low-content Pt electrocatalyst (Pt/NiCu) was prepared by combining co-electrodeposition of nickel and copper onto a fluorine-doped-tin-oxide (FTO) substrate and chemical reduction of Pt precursor. The performance of the as-prepared catalyst for ethanol electro-oxidation was studied by multi-cyclic voltammetry, current-time curve and electrochemical impedance spectroscopy. The result showed that the molar ratio of Ni/Cu in the electroplating solution had an obvious effect on the activity of the catalysts. Pt/NiCu₂ prepared from the solution of 0.02 mol/L CuSO₄ + 0.04 mol/L NiSO₄ exhibited superior catalytic activity and anti-poisonous tolerance toward ethanol electro-oxidation compared to the solely electrodeposited nickel and copper supported Pt. The excellent performance of Pt/NiCu₂ was mainly attributed to the proper molar ratio of Ni/Cu achieving an ideal cooperation of NiCu and Pt, and relatively small charge-transfer resistance.

Keywords: Direct ethanol fuel cells (DEFCs); NiCu nanocomposite; Ethanol electro-oxidation; Electrodeposition

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