Electrochemical oxidation of ethanol on palladium electrodeposited on nickel catalyst

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Abstract: Direct ethanol fuel cells have a potential to be used as power sources in the future. Platinum is the main catalyst used in the system. Because Pt is very expensive, other catalysts have been investigated to be used instead of Pt. In this work, the reaction at the anode side of the ethanol fuel cells was investigated. Palladium was electrodeposited onto a nickel plate (1 × 8 cm) and used as the catalyst for ethanol oxidation reaction. The electrodeposition was performed by scanning potentials between -0.2 and 1 V (versus Ag/AgCl). Cyclic voltammograms confirmed the deposition of palladium onto the nickel plate surface. The coverages of palladium on the nickel surface were controlled by the number of deposition cycles which resulted in palladium coverage between 10 and 80%. In alkaline media, this palladium-nickel catalyst had comparable catalytic activity and stability to those of platinum catalyst. The addition of palladium to nickel led to some improvement in electrocatalytic activity and stability of nickel catalyst. The results showed that this modified catalyst was effective and had a potential to be used as the catalyst for ethanol oxidation in direct ethanol.

Keywords: Nickel catalyst; Electrodeposition; Ethanol oxidation; Palladium catalyst; Direct ethanol fuel cells