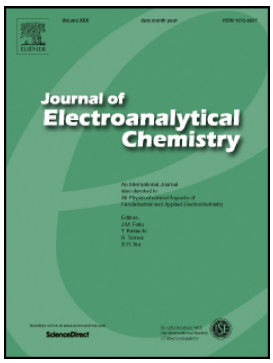

Interconnected nanoparticle-stacked platinum-based nanosheets as active cathode electrocatalysts for passive direct methanol fuel cells

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Interconnected nanoparticle-stacked platinum-based nanosheets as active cathode electrocatalysts for passive direct methanol fuel cells

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Abstract: Interconnected nanoparticle-stacked two-dimensional Pt and porous PtNi alloy nanosheets are synthesized via galvanic replacement of Ni nanobelts. The Pt and porous PtNi nanosheets achieve a factor of approximately 1.3 and 2.3 enhancement in mass activity at 0.9 V versus RHE for oxygen reduction reaction relative to commercial Pt black, respectively. The practicability of Pt and porous PtNi nanosheets used as cathodic electrocatalysts for passive direct methanol fuel cells (DMFCs) is investigated. The passive DMFCs with Pt nanosheets (1.0 $mg_{(Pt)}$ cm^{-2}) and porous PtNi nanosheets (0.8 $mg_{(Pt)}$ cm^{-2}) exhibit excellent performance with satisfactory stability at 25 °C, which is slightly higher than that of the conventional cell with 2.0 $mg_{(Pt)}$ cm^{-2}. The performance improvement of cells with Pt and porous PtNi nanosheets is attributed to the enhanced electrocatalytic activity and decreased charge transfer resistance of the cathodic catalyst layer. Benefiting from the porous structure of the PtNi nanosheets, the cell's performance is further boosted due to an increased Pt utilization. This work may provide an applicable approach to develop