Durability and performance of direct glycerol fuel cell with palladium-aurum/vapor grown carbon nanofiber support

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Abstract:

Oxidation reaction of glycerol has the probability of producing intermediate species that may be toxic to the catalyst surface and blocks the catalyst function. Thus this study presents the performance and durability of glycerol fuel cell with novel catalyst, Palladium-Aurum catalysts supported on Vapor Grown Carbon Nanofiber to reduce this effect. The electrochemical behaviour tests indicate that nanoalloy with mole ratio of Palladium to Aurum (1:1) is the best nanocatalyst that can achieve a maximum mass current of 0.17A mg^{-1} based on cyclic voltammetry analysis on glycerol oxidation in alkaline media. Apparently, the cell performance was improved from 0.0058 W cm^{-2} with Palladium black to 0.007 W cm^{-2} via Palladium-Aurum/Vapor Grown Carbon Nanofiber. Moreover, the present of Vapor Grown Carbon Nanofiber, as a support, give stability and durability to the catalyst due to unnoticeable deactivation after being used several times. In addition, the influence of the operating conditions (example: temperature and Sodium hydroxide concentration) towards the electrochemical kinetic activity was also studied in detail through the determination of the activation energies.