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Abstract
Proton Exchange Membrane Fuel Cells with some versatile advantages are chosen as the electric power for portable electronic devices and communication equipments. However, the high cost of PEMFCs exists as an obstacle that prevents them being a popular commercial product. One sector which contributes to the cost of PEMFCs is the use of platinum as the catalyst for hydrogen oxidation and oxygen reduction. In addition, PEMFCs run on pure hydrogen are limited because of purification cost, large storage volume and safety issue. The use of hydrogen-rich gas from reforming system is becoming more common than pure hydrogen. However, hydrogen-rich gas contains a certain concentration of carbon monoxide, which causes platinum surface poisoning. The combination of platinum and a transition metal is a solution to reduce the amount of platinum catalyst as well as to protect platinum from poisoning by carbon monoxide.
In this work, a new method to fabricate a bimetal catalyst with platinum ruthenium supported on carbon nanotubes was introduced. In order to maximize electrocatalyst activity, the fabrication procedure includes two steps of spontaneous deposition: ruthenium was first deposited on the side-walls of carbon nanotubes, and then platinum was loaded on the ruthenium/CNTs composite to form PtRu/CNTs. The morphology and microstructure of home-made catalysts were characterized by Transmission Electron Microscope. The performance of PtRu/CNTs was evaluated by using cyclic voltammetry method and applying on a single cell. The results showed that in comparison with commercial Pt dispersed on carbon black (E-TEK, Inc.) product, the catalyst fabricated by two-step spontaneous deposition has a lower platinum loading (25%) and higher carbon monoxide tolerance. A similar performance has been found between PtRu/CNTs and PtRu/C 20 wt.% (E-TEK, Inc.) when they’re utilized at the same Pt loading in anode for PEMFC run on both hydrogen and hydrogen & CO mixture. The home-made catalyst is a promising choice to be used in direct alcohol fuel Cell (DMFC) for improving the methanol and ethanol oxidation.
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