Pt/TiO_2–C Electrocatalysts Prepared by Chemical Vapor Deposition with High Tolerance to Alcohols in Oxygen Reduction Reaction

F.M. Hernández-Mendoza[1], M.E. Beltrán-Perez[1], O. Martínez-Alvárez[1], V. Granados Alejo[1], B. Ruiz-Camacho[1,*]

[1]Ingeniería en Energía, Universidad Politécnica de Guanajuato, Av. Universidad Norte s/n, Juan Alonso Cortázar Guanajuato, México, 38438

[*]Tel: +52-462-4414307; e-mail: beatrizr@upgto.edu.mx

ABSTRACT

Pt nanoparticles were synthesized by chemical vapor deposition and were deposited on carbon and TiO2–C substrates. The Pt/C and Pt/TiO2–C catalysts synthesized were characterized by TEM and XRD techniques. Cyclic voltammetry and rotating disk electrode measurements for the Oxygen Reduction Reaction (ORR) were investigated in acid medium in presence of alcohols as methanol and ethanol. A Pt/C commercial sample was tested at the same conditions for comparison purposes. It was found that the catalyst nanoparticles were homogenously distributed over the carbon and TiO2–carbon substrates with a mean particle size about 3 nm. Significant differences in the electrochemical results and alcohols tolerance are observed in the samples prepared in comparison whit Pt/C commercial catalyst. The methanol tolerance of the catalysts synthesized was higher compared to the ethanol tolerance. The electrochemical activity of Pt/TiO2–C catalyst prepared with TiO2 rutile phase was not affected by the presence of alcohols in comparison with Pt/C samples. It is explained by the thermal treatment over Pt/TiO2–C during the synthesis process that produces a synergetic effect caused by the formation of the interface between the platinum and oxide materials where titanium oxide acts as a protecting agent of platinum nanoparticles

Keywords: Pt nanoparticles, chemical vapor deposition, DMFC