XIV International Congress of the Mexican Hydrogen Society
Cancun, Mexico, 2014

Pd Synthesized by Electrochemical Techniquesin Three-Dimensional Carbon Electrodes

N. Arjona[1], M.-A. Goulet[2], M. Guerra-Balcázar[3], J. Ledesma-García[3], E. Kjeang[2,**], L. G. Arriaga[1,*]

[1]Centro de Investigación y Desarrollo Tecnológico en Electroquímica, Querétaro, México, 76703.
[2]School of Mechatronic Systems Engineering, Simon Fraser University, 250-13450 102 Av., Surrey, BC, Canada, V3T 0A3
[3]División de Investigación y Posgrado, Facultad de Ingeniería, Universidad Autónoma de Querétaro, Querétaro, México, 76010.
[*]Tel: +524422116069 larriaga@cideteq.mx; [**]Tel: +17787828791 ekjeang@sfu.ca

ABSTRACT

One of the main strategies to enhance the electrocatalytic activity is related to the use of supports with high surface area. In this sense,we used three-dimensional Toray carbon paper. The electrochemical properties of this material as substrate-electrode were evaluated with and without thermal treatment using potassium ferrocyanide as target molecule. Without thermal treatment the electrode exhibited a poor reversibility of the ferrocyanide specie. With the thermal treatment the Toray paper showed good electrochemical properties which could be attributed to the enhancement of the electrode wettability. After that, Pd materials as electrocatalysts were synthesized using two different electrochemical techniques in the heat treated Toray paper as working electrode: cyclic voltammetry (namely Pd_1) and differential pulse voltammetry (Pd_2). The electrochemical active surface area (ECSA) was determined by cyclic voltammetry in 0.5 M H_2SO_4resulting in areas of 16 and5.7-fold higher than the geometrical area for Pd_1 andPd_2, respectively. The electrocatalytic activity was tested toward the 0.1 M formic acid electrooxidation reaction in basic medium (0.3 M KOH). The current density was of 1.76, and 0.6 mA cm^{-2}, respectively. The potentials for the formic acid oxidation were located at -0.38 and -0.40 V *vs*. NHE.

Keywords: Toray paper, three-dimensional electrode, formic acid electrooxidation.