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Microstructural Analysis of Modified Gas Diffusion Layer for a Water PEM Electrolyzer

G. I. Alba[1], R. Barbosa[3], B. Escobar[4], Y. Verde-Gomez[4], L.G. Arriaga[1], J. C.Cruz[2,*]

[1]Centro de Investigación y Desarrollo en Electroquímica S.C., Parque Tecnológico Querétaro s/n, Sanfandila, Pedro Escobedo, Qro., México, 76703.
[2]Instituto Tecnológico de Chetumal, Av. Insurgentes 330, Chetumal, Q. Roo, México, 77013.
[3]Universidad de Quintana Roo, Boulevard Bahía s/n, Chetumal, Q. Roo, México, 77019.
[3]Instituto Tecnológico de Cancún, Av. Kabah Km. 3, Cancún, Q. Roo, México, 77500.
[*]Tel: +529831043002; e-mail: jcca12345@hotmail.com

ABSTRACT

The water electrolysis is a process capable of producing high purity hydrogen (H2 ≈ 100%), due to its electrochemical conversion of hydrogen and oxygen. However, the operating conditions required materials that can resist aggressive environmental as high overpotencials and low pH values. The composition and structure of the elements that constituting the gas diffusion layer (GDL) of a Proton Exchange Membrane Electrolyzer (EPEM), affects the global performance of the cell itself. But also in the mass transport of the reactants due to reaction. In this work are presented the results of a morphologic and modified titanium porous matrix. The analysis includes the determination of the microstructural influence for the mass transport through numerical simulation and statistical characterization techniques. Two different etching attacks were performed to modify the porous matrix, these chemical etchings corresponds to a: one mix acidic solution of HCl/H_2SO_4 17 and 27 %v/v respectively, and attached by a oxalic acid solution 0.1 M both were performed a different times. Therefore, the GDL were characterized by SEM at different magnifications to determine the microestrutural statistical differences among the three matrix (two modified and one without modification) and its stochastic reconstruction. Subsequently a surface area characterization was performed by BET absorption technique to calculate the porosity on the different matrix.

Keywords: Microstructural Analysis; Gas Difussion Layer; Etching attack.