

Flooding and Dehydration Processes in a PEM Fuel Cell. A Phenomenological Analysis Based on EIS Measurements

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ABSTRACT

In this work a study on the phenomena occurring within a PEM fuel cell during the flooding and dehydration processes is presented. The study consisted of voltage control electrochemical tests on a 50 cm² geometrical active area fuel cell, under controlled conditions to promote flooding or dehydration. During the chronoamperometric tests, electrochemical impedance spectroscopy (EIS) measurements were carried out. The EIS analysis was based on the use of a Randles-type electric equivalent circuit. This circuit, represent through its electrical components, the characteristic properties of the electrochemical system and their variation when the experimental conditions change as a result of the catalysis layer flooding or dehydration of the electrolyte. The results, allowed us to explain phenomena as the interfacial and the charge and mass transport occurring within the fuel cell. In addition, through a sensibility analysis, the electrical parameters directly related with the flooding and dehydration processes were identified; as well as the conditions under which they can be used as control variables in the design of strategies for failure diagnostics and prediction in PEM fuel cells.

Keywords: EIS; PEMFC; Flooding-Dehydration.

