Development of an Electronic Device for Impedance Measurements for Online PEMFC Failure Diagnostic Applications

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ABSTRACT

In this work, the design and construction of a small and low cost impedance measurement device is presented. The device was developed for online dehydration and flooding PEMFC's diagnostic applications, therefore, its design allows interaction through a SPI communication protocol with the PEMFC´s control system. Applying a sinusoidal signal at two pre-set frequencies, this device based on analog circuits, has the ability of negligibly disturb the PEMFC's stable operation point and measure the current, voltage, and phase angle of the signal response. Then, based on these measurements, the imaginary and real impedance components as well as the impedance magnitude are calculated. The device also has the ability to perform electrochemical impedance measurements online at open circuit (no current generation) or in operation (during current generation) and it is applicable to every electrochemical cell, capable of generating an output potential in the 1.01 – 60 V range and at least 150 mA current.

Keywords: EIS; PEMFC; Online diagnostic.