Flicker Noise Spectroscopy in the Analysis of Electrochemical Noise of Hydrogen-air PEM Fuel Cell During its Degradation

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A variation in fluctuation dynamics of the noise component of the electric potential of a fuel cell was studied. A fuel cell with polymer membrane and gas diffusion layer was tested and treated with a fast degradation procedure. The characteristics of electrochemical noise were obtained using a flicker noise spectroscopy that provides an analysis of a cosine-spectrum of autocorrelation function and second order difference moment of voltage noise. A sequence of fast degradation steps results in a change of maximum load current of a polymer electrolyte membrane fuel cell. The main effect of fast degradation on the noise parameters is the change in the ratio of areas (i.e. power) of the low-frequency peak (a range of $\Delta f_{LF} = 0.001 - 0.003$ Hz) to the high-frequency peak (a range of $\Delta f_{HF} = 0.258 - 0.262$ Hz) in cosine-spectrum of the autocorrelation function.

Keywords: Fuel cell, degradation, electrochemical noise, flicker noise spectroscopy.

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