

Electrochemical impedance spectroscopy analysis for carbon degradation by voltage hold control in polymer electrolyte membrane fuel cell

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Polymer electrolyte membrane fuel cells (PEMFCs), which are environmentally friendly and efficient, have been intensively researched and developed for automobile and stationary applications. However, the issue of improving durability is pointed out as a weakness, of which performance degradation due to carbon corrosion within electrodes is the biggest issue. To produce a more stable and economical system, it is necessary to improve the durability of PEMFCs. In particular, carbon corrosion within the electrode needs to be analyzed accurately to improve durability.

The effect of degradation voltage and relative humidity in accelerated degradation of fuel cells was analyzed by electrochemical impedance spectroscopy. For this, a transmission-line model based equivalent circuit was used, where the resistance to proton transport in the cathode was considered. As the degradation voltage increased from 1.3 V to 1.5 V, the performance decay, and the charge transfer resistance, gradually increased. It appears that the change in charge transfer resistance leads to the change in ionic resistance.