

Surface Treatment of Nafion® Membrane and its Effects on Cell Performance

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Proton exchange membrane fuel cell (PEMFC) is considered as a clean and efficient energy conversion device for mobile and stationary applications. Among all the components of the PEMFC, the interface between the electrolyte and electrode catalyst plays an important role in determining the cell performance since the electrochemical reactions take place at the interface in contact with the reactant gases. Therefore, to increase the interface area and obtain a high-performance PEMFC, surface of the electrolyte membrane was roughened by Ar⁺ beam bombardment. The results imply that by modifying surface of the electrolyte membrane, platinum loading can be reduced significantly without performance loss. To optimize the surface treatment condition, effects of ion energy and ion dose density on characteristics of the membrane/electrode interface were examined by measuring the cell performance, impedance spectroscopy, and cyclic voltammograms. Surface of the modified membranes were characterized using scanning electron microscopy, atomic force microscopy, and FT-IR.