Evaluation of Water Transport Characteristics of PEM Fuel Cell Diffusion Media

Polymer electrolyte membrane (PEM) fuel cells are under development for a wide range of portable power, transportation, and stationary applications. Proper water management in the electrodes of PEM fuel cells is essential to achieving efficient operation. Detailed multi-physics models of transport processes within the electrodes have been developed over the last decade. However, in several areas, the development of experimental techniques for characterizing the electrode transport properties has not kept pace with modeling advances. Recently developed techniques provide approaches for measuring critical gas diffusion media transport properties including the dependence of capillary pressure on liquid saturation and the dependence of liquid relative permeability on saturation.

We have demonstrated experimental techniques relevant to gas diffusion media that allow us to measure the relationship between liquid saturation and capillary pressure and to measure the relative permeability of the media to both liquid and gas phases. These techniques provide an experimental basis for relating diffusion media characteristics to factors such as compression and wet-proofing, thus providing guidance for diffusion media design and for overall improvement of PEM fuel cell performance.