Simultaneous Water and Current Distribution Measurements in a Polymer Electrolyte Fuel Cell

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Water transport in the polymer electrolyte fuel cell (PEFC) membrane and in the gas diffusion layers and channels has been experimentally studied and/or modeled by many (e.g. refs. 1-8, among others). In addition, several experimental studies have attempted to condense water from the anode or cathode effluent streams and deduce the effective water balance within the cell.[9,10] While these data are highly valuable, this method of condensing effluent water relies on the assumption of a steady state over long time periods to allow accumulation of significant amounts of liquid water to avoid high measurement error. In a previous presentation,[11] the authors demonstrated the ability to accurately measure the *in situ* water vapor mole fraction distribution in an operating PEFC, without the need for condensation of the water vapor.

In order to further validate this experimental technique and to provide insight into water transport mechanisms within the PEFC, a detailed study has been completed to perform a mass balance of all water input, generated, and exhausted from the fuel cell as a function of location along both the anode and cathode flow paths. The 50 cm^2 active area fuel cell used in this study has a single channel, serpentine design and is segmented to allow simultaneous current density distribution measurements, as described in refs 12 and 13.

The detailed data taken from this investigation should provide baseline data for model validation and insight into water transport phenomena.

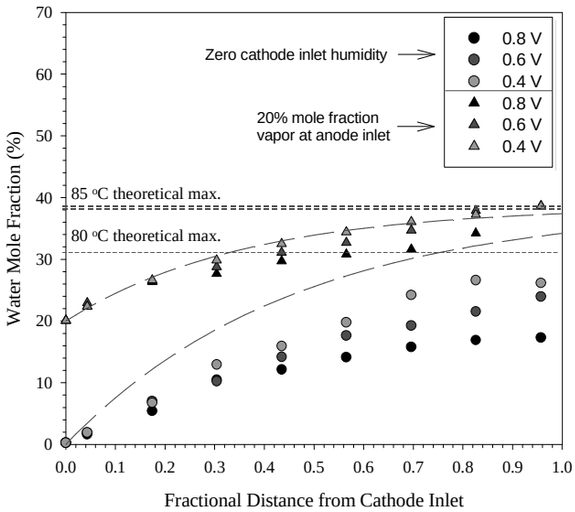

Figure 1. Measured water vapor uptake versus location in the cathode of a 50 cm^2 single channel serpentine fuel cell.

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