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Determination of water diffusion in a polybenzimidazole membrane

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Abstract

A polybenzimidazole (PBI) based polymer electrolyte fuel cells, which called high temperature polymer electrolyte fuel cells (HT-PEMS), operate at higher temperatures (120-200^{o}C) than conventional PEM fuel cells. Although it is known that HT-PEMS have some of the significant advantages as non-humidification requirements for membrane and the lack of liquid water at high temperature in the fuel cell, the generated water as a result of oxygen reduction reaction causes in the degradation of these systems. In this work, water transport via absorption into the electrolyte and PBI membrane will be experimentally measured and correlated for a wide range of temperature. The generated water absorbed into membrane side interacts with the hydrophilic PBI matrix and it can cause swelling of membrane, so water transport mechanism in a membrane electrode assembly (MEA) needs to be well understood and water balance must be calculated in MEA. Therefore, the water diffusion transport across the electrolyte will be measured. This will be realized using a measurement system including concentration cell which is hold in Hydrogen Energy Technology Laboratory at Department of Energy System Engineering. Measurements of water diffusivity across the membranes will be measured as a function of operating temperature from 120 to 180^{o}C. The results of this work will be widely useful to make more accurate modeling of high temperature fuel cells.

Biography

Okan Ozturk has completed his bachelor's science in Mechanical Engineering department from Erciyes University and is also Master Science's student. He studies on polymer electrolyte fuel cell.