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Modeling and Analysis the Effects of Temperature and Pressure on the Gas-Crossover in Polymer Electrolyte Membrane Electrolyzer

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Abstract : Hydrogen produced by means of polymer electrolyte membrane electrolyzer (PEME) is one of the most promising methods due to clean and renewable energy source. In the process, some energy loss due to mass transfer through a PEM is caused by diffusion, electro-osmotic drag, and the pressure difference between the cathode channel and anode channel. In PEME water molecules and ionic particles transferred between the electrodes from anode to cathode, Extensive mixing of the hydrogen and oxygen at anode channel due to gases cross-over must be avoided. In recent times the consciousness of safety issue in high pressure PEME where the oxygen mix with hydrogen at anode channel could create, explosive conditions have generated a lot of concern. In this paper, the steady state and simulation analysis of gases crossover in PEME on the temperature and pressure effect are presented. The simulations have been analysis in MATLAB based on the well-known Fick's Law of molecular diffusion. The simulation results indicated that as temperature increases, there is a significant decrease in operating voltage.

Keywords : diffusion, gases crosover, steady state, Fick's law
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