Computational Analysis of Mixed Potential Effect in Proton Exchange Membrane Fuel Cells

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In typical proton exchange membrane fuel cell (PEMFC), a hydrogen crossover brings unexpected parasitic reaction, such as carbon oxidation at cathode electrode, which reduces open circuit potential due to mixed-potential effect. Therefore, this paper has investigated the effect of gas crossover during non-isothermal operation of PEMFC. A two-dimensional computational fluid dynamics model was formulated on the basis of previously reported modeling framework by the authors. The presented model was validated with cell polarization data taken from experimental data prepared by the decal transfer method, which was good. Model comparisons were also conducted to clearly estimate the validation process, as well as exchange current density. Several cases on membrane properties were verified to present their influences on voltage loss.