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Performance Limitation by Reactant Crossover in a Membraneless Fuel Cell ISAAC SPRAGUE, PRASHANTA DUTTA, Washington State University — In the past decade, the paradigm of using micro fuel cells for portable power applications has inspired novel innovations in fuel cell technology. One such example is the laminar flow fuel cell (LFFC) which utilizes colaminar flow to maintain the separation between the anode and cathode instead of a membrane. Although the membraneless LFFC provides a simple design for prototype development, the lack of a physical separation can permit oxidant as well as fuel to crossover and impact device performance adversely. To understand the effect of reactant crossover and its effect on the performance of LFFC a mathematical model is developed. The model includes a more general treatment of reactant crossover than the common method where it is assumed that the crossover flux is fully utilized as crossover current. This model is used to study the performance of a LFFC operating with different electrode lengths and separations. Numerical results show that the reactant crossover, transport limitations, and Ohmic losses are the primary performance limitation factors. The fuel cells with shorter channel heights suffer from transport limitations at the longer electrode lengths even when reactant crossover is neglected.

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