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Analysis of Fluid Dynamics and Reactant Consumption in Microchannel Based Fuel Cells JOSEPH DALESSANDRO, PETRU FODOR, Cleveland State University — In this work, the fluid dynamics within a membraneless microchannel fuel cell is analyzed computationally. The membraneless design is a result of the laminar nature of the fluid flow at small Reynolds numbers, restricting the fuel and oxidant to the vicinity of the corresponding electrodes, without the need of a proton exchange membrane (PEM). The performance of such cells is limited by the mass transport near the electrodes, with much of the reactants leaving the channel without coming in contact with the catalytic surfaces. We use various strategies similar with those used in grooved micromixers to overcome this limitation. While the flow is still laminar in nature, the addition of ridges to the top and bottom of the cell introduce a transverse element to the fluid flow, increasing reactant consumption and overall cell efficiency. The characteristics of the cells are investigated as a function of the Peclet number.

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