Understanding the effect of channel tolerances on performance of PEMFCs

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Distributions in the concentration of reactant species in a PEMFC can cause distributions in local current density, temperature, and water content over the area of a PEMFC. These distributions can lead to effects such as flooding and MEA dehydration thus causing stresses in different regions of the fuel cell. Changing flow-field configurations and channel characteristics have been shown to also affect the cell performance and uniformity indistributions. This work investigates how performance and distributions in a baseline laboratory cell prepared by a precise machining method compared with others from alternative manufacturing processes (e.g., stamping, electrochemical etching, hydroforming,etc.). Specifically we examine ?typical? variations in the channel width, height, and undercut that may occur with alternatively manufactured metal plates and compare those with sample-to-sample variations that may occur with between laboratory-scale graphite plates. This work will provide fundamental information that can be used to develop tolerance and design principles for manufacturing PEMFC bipolar plates.

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