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**Keith S. Promislow\*** (kpromisl@math.msu.edu), Dept. of Mathematics, Michigan State University, East Lansing, MI 48824. *Proton Conduction in Polymer Electrolyte Membranes.*

Polymer electrolyte membranes (PEMs) play a key role as proton conductors and reactant separators in PEM fuel cells. They are phase separated materials with a percolating, hysteretic nanoscale pore morphology. We describe a model for both the pore formation within the polymer and the conduction of protons within the network. In particular we propose a novel higher-order curvature driven flow for the network formation and pose this within an abstract framework of the functionalization of convex energies as a process which generically describes the formation of a percolating sub-structure within a background matrix. (Received September 12, 2008)