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Proton transport through polymeric membranes XINYU WANG, Dept. of Physics, Univ. of Mass., RICH WOUDENBERG, Dept. of Polymer Science and Engr., Univ. of Mass., OZGUR YAVUZCETIN, Dept. of Physics, Univ. of Mass., SERGIO GRANADOS, Dept. of Polymer Science and Engineering, Univ. of Mass., BRYAN COUGHLIN, Dept. of Polymer Science and Engr., Univ. of Mass, MARK TUOMINEN, Dept. of Physics, Univ. of Mass., M.T. TUOMINEN TEAM, E.B. COUGHLIN COLLABORATION — Hydrogen fuel cells have drawn increasing attention from researchers because of the steadily declining supply of fossil fuels. A key component of a fuel cell is a membrane that is an efficient conductor of protons, but not electrons or molecules. Nafion currently is the dominant material chosen for this purpose, with proton conductivity facilitated by an imbibed network of water. Unfortunately, this material loses its conductivity as it becomes dehydrated at elevated temperatures. In this work we make a detailed examination of the physics of proton conductivity in anhydrous polymeric membranes though temperature-dependent DC current-voltage characterization, AC impedance spectroscopy and Hall effect measurements. We assess the relevance of fundamental proton conductivity models involving thermo-mechanical and electro-mechanical transport mechanisms. This work is supported by DOE grant 10759-001-05, NSF grant DMR-0306951 and MRSEC.

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