Performance and durability of HT-PEM Fuel Cells

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High Temperature Polymer Electrolyte Membrane (HT-PEM) Fuel Cells provide an attractive alternative to Low Temperature (LT) PEM fuel cells with respect to fuel flexibility, simplified cooling system and balance of plant, higher value waste heat and no need for humidification of reactants. Polybenzimidazole (PBI) membranes doped with phosphoric acid have been demonstrated to be the most successful system to achieve high temperature operation of HT-PEM fuel cells. HT-PEM fuel cells face a number of challenges related to the performance that needs to be addressed.

In this work we present the recent PBI membrane and single-cell fuel cell testing results based on both traditional fuel (H2) and a novel approach based on hydrogenation/de-hydrogenation of a polyol as fuel. The two systems will be compared in terms of performance and durability. In addition, we present results on NMR studies on the PBI polymer. Lastly, we show preliminary results on post-mortem cell characterizations which are the key for understanding the breakdown mechanisms and maximizing cell performance and lifetime.