

4ck Beyond Hydrogen and Methanol - Development of Direct Ethanol PEM Fuel-Cell Systems

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Fuel cells are a means of generating electricity without Carnot-cycle limitations on system efficiency while drastically reducing the emission of pollutants. Operation of a fuel cell on hydrogen yields the highest fuel-cell performance, but the low energy density of hydrogen drastically increases system volume. Additionally the purity requirements of hydrogen for utilization in a PEM fuel cell are very stringent and generally requires the use of multiple fuel processing units.

Methanol has been studied extensively as a high-energy density alternative to hydrogen, but ethanol is non-toxic, and has a 30% higher energy density than methanol.

The development of direct ethanol PEM fuel-cell systems is discussed including:

1. the selection and synthesis of new anode electrocatalysts for ethanol electrooxidation by expanding the search space for new electrocatalysts,
2. the determination of appropriate operating conditions for measuring electrocatalyst performance in-situ,
3. the characterization of anode performance in an operating direct ethanol PEM fuel cell, and
4. novel system designs to simplify multi-cell systems for efficient micro-power packaging.