Direct Methanol Fuel Cell Operating With Concentrated Methanol

John Staser, Corey Grice, Mohammad Taslim, Mehdi Abedi

j.staser@nuvant.com, 219-644-3231

NuVant Systems, Inc. is developing a method for mitigation of methanol crossover by use of porous structures for uniform delivery of highly concentrated or neat methanol to the anode electrode. The methanol distributed at the anode catalytic layer is diluted by back-diffusion of water from the cathode: The actual methanol concentration within the catalytic layer is thus similar to the more classical direct methanol fuel cell (e.g. 0.5 – 2 M). This strategy minimizes fuel crossover and enables high gross fuel energy density. The use of near neat methanol is highly advantageous over introduction of dilute methanol to the anode flow field. The poster will show various porous structures and their associated pore dimensions and permeability. Experimental results obtained with the porous structures under fuel cell operation with concentrated methanol, for both single cells and miniature stacks, will be included.

The porous structures have built-in flow-fields that enable proper distribution of the concentrated methanol over the entire area of the electrode. In order to determine which flow-field design yields the correct distribution of the fresh and concentrated liquid feed, CFD models are being developed. The impact of various parameters, investigated using those CFD models, will be discussed. Comparison between single cell and miniature stack performance will also provide insight into scale up feasibility.