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Modeling the transient temperature distribution in a Direct Methanol fuel cell

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Abstract:

A mathematical model to study the transient temperature distribution across a Direct Methanol fuel cell (DMFC) is developed. The model studies the temperature distribution across passive and active DMFCs. The DMFC is divided into 5 layers, namely the anode backing layer (ABL), the anode catalyst later (ACL), the membrane layer, the cathode catalyst later (CCL) and the cathode backing layer (CBL). The transient temperature distribution across all the five layers is developed as a function of process parameters and performance parameters namely methanol flow rate, reservoir concentration and current density. The transient heat generation at the anode and cathode catalyst layers are modelled. The heat generated is shown to vary with input methanol concentration. The model predicts that the highest temperature profile is seen across the cathode catalyst layer. For the given set of parameters, temperature profiles across the cell are seen to reach steady state around 45 minutes. Polorization curves are compared with experimental data and found to compare well with experimental results.

Key words: Methanol, flow rate, temperature, current density

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