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L. An, R. Chen

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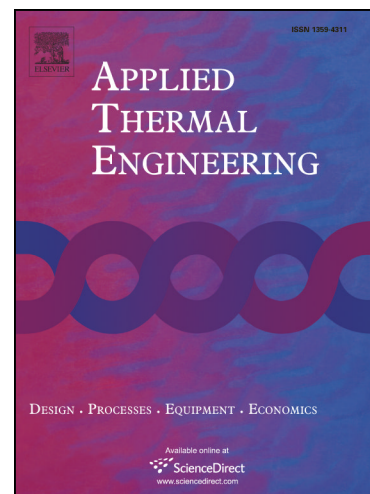
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**Mathematical modeling of direct formate fuel cells**L. An<sup>a,\*</sup> and R. Chen<sup>b,c,\*</sup>

<sup>a</sup> Department of Mechanical Engineering, The Hong Kong Polytechnic University, Hung Hom, Kowloon, Hong Kong SAR, China

<sup>b</sup> Key Laboratory of Low-grade Energy Utilization Technologies and Systems (Chongqing University), Ministry of Education, Chongqing 400030, China

<sup>c</sup> Institute of Engineering Thermophysics, Chongqing University, Chongqing 400030, China

\*Corresponding authors.

<sup>a</sup> Tel.: 852-27667820; fax: 852-23654703; e-mail: [liang.an@polyu.edu.hk](mailto:liang.an@polyu.edu.hk) (L. An)

<sup>b,c</sup> Tel.: 86-23-65102474; fax: 86-23-65102474; e-mail: [rchen@cqu.edu.cn](mailto:rchen@cqu.edu.cn) (R. Chen)

**Abstract**

In this work, we develop a one-dimensional mathematical model for direct formate fuel cells (DFFC), which incorporates transport and electrochemical processes. The present model is validated against literature experimental results and it shows good agreement. In addition, we also investigate effects of operating and structural parameters on the cell voltage. Results exhibit that the cell voltage is increased with the reactant concentration, including formate, hydroxide ions, and oxygen, which originates from the reduced activation polarization and concentration polarization. Moreover, it is also shown that increasing the exchange current density much reduces electrode overpotentials and thus upgrades the cell performance. The model is further used to examine how the anode diffusion layer and the membrane affect the cell performance. It is found that the cell performance is upgraded with increasing the porosity of the anode diffusion layer and decreasing the thickness of the anode

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