عنوان مقاله:

Three-dimensional modeling of transport phenomena in a planar anode-supported solid oxide fuel cell

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خلاصه مقاله:

In this article three dimensional modeling of a planar solid oxide fuel cell (SOFC) was investigated. The main objective was to attain the optimized cell operation. SOFC operation simulation involves a large number of parameters, complicated equations (mostly partial differential equations), and a sophisticated simulation technique; hence, a nite element method (FEM) multiphysics approach wasemployed. This can provide 3D localized information within the fuel cell. In this article, SOFC ef ciency improvement has been investigated based on optimization parameters. For the rst time, radiation heat transfer equations were considered in addition to the effects of conduction and convection heat transfer in 3D simulation in a planar cell. This effect has been neglected in all previous SOFCs simulations. Based on the proposed equations, the emissivity effect on temperature distribution was studied. The maximum location is where temperature and hydrogen mass fraction are high in the fuel. Radiation heat transfer between the channel wall and the uid and also in between the cell and ambient outside have been employed. Minimizing the ohmic drop by optimizing the cathode layer thickness is another new aspect in this research. According to this optimization simulation, it is possible to achieve maximum current density.

کلمات کلیدی:

Solid oxide fuel cells,Anode-supported,Modeling,Radiation heat transfer,Optimization simulation