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HEAT TRANSFER ANALYSIS OF RADIATION IN PLANAR SOLID OXIDE FUEL CELLS

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RÉSUMÉ

Radiative transport within the electrode and electrolyte layers, as well as surface-to-surface radiation within the fuel and oxygen flow channels, has the potential to greatly influence temperature fields and overall operating conditions of solid oxide fuel cells (SOFC). Radiation from the stack to the environment, including heat losses through insulation, must be accounted for in the plant design, and is very important for effective thermal management of the high temperature stack. On the other hand, a parametric study was conducted to study the influence of temperature distribution and radiation effect. The problems of radiation and conduction are solved with finite-volumes. Consequently, the authors newly develop a two dimensional simulation code of the planar SOFC stack, and the detailed effect of the radiation heat transfer is investigated .This is because the thermal conductivity of the cell materials made of ceramics is very small, and the central part of the cell stack is almost free form the influence of radiation heat transfer. The combination between non-gray radiation heat transfer and convection-conduction heat transfer is studied.

MOTS-CLÉS : solid oxide fuel cell, radiation modeling, heat transfer, temperature distribution, SOFC