ChemTech

International Journal of ChemTech Research
CODEN(USA): IJCRGG, ISSN: 0974-4290, ISSN(Online):2455-9555
Vol.10 No.6, pp784-792,2017

Modeling of a one dimensional Anode supported high temperature tubular SOFC

Pankaj Kalra[1],Rajeev Garg[2]and Neel Kanth Grover[3]

[1,2] Department of Chemical Engineering, SBSSTC- Ferozepur- 152004 Punjab India
[3] Department of Mech. Engineering, SBSSTC- Ferozepur- 152004 Punjab India

Abstract:SOFCs are under research mainly for their use in stationary power generation application and other standby applications. A tubular one dimensional model has been developed in this research work. In the anode-supported SOFC, electrolyte and cathode are very thin (for an example, 50µm) but the anode thickness is generally thicker than 100µm, thinner electrolyte provides lesser resistance for the movement of O^{2-} through leading to higher value of developed voltage & power density.The SOFC tube has been discretized along its longitudinal axis with nodal variation of concentration of components, temperature, current and voltage along the axis of the tube. The numerical modelling considers internal reforming through the methane reforming and water gas shift reactions taking place along with the electrochemical reactions on the surface Ni-YSZ anode. Besides the reaction kinetics, the mass-transfer processes have also been included in this one dimensional model. In this paper, a novel approach for the axial symmetric simulation of the SOFC tube is presented by applying finite element method,taking into account the variation of the properties with their nodal variation due to change in concentration and temperature and their effect on the voltage and power density developed.

Keywords: Solid oxide fuel cell (SOFC), Ni-YSZ anode.Current density, Voltage, Power density.

*****