Numerical Modeling for Full Channel Solid Oxide Fuel Cell

박주연, 이성철*
한양대학교
(scyi@hanyang.ac.kr*)

A three-dimensional (3D) computational fluid dynamics (CFDs) model was developed to estimate intermediate temperature solid oxide fuel cells (IT-SOFCs) including full channel design. Mass, momentum, energy(temperature distribution), species conservation and transport were simulated by the commercial CFD code FLUENT. The developed model describes the detailed electrochemical reactions in functional layer of Ni/YSZ cermet anodes and LSM/YSZ composite cathodes based on the triple phase boundary (TPB) electrochemical active area. The distributions of temperature and fuel/air composition through the channels and PEN (positive electrode/ electrolyte / negative electrode) structure were studied. A parametric study was performed to investigate the fully developed laminar flow at the fuel/air channel with the effect of co-, counter-, and cross flow configuration. The TPB active area which affects the cell performance was estimated by various porosities and particle size.