Symp A4

Influence of Cathode Channel Configurations on the Performance of Air-Brea thing PEMFC

채널 형상이 공기호흡형 고분자 전해질 연료전지 성능에 미치는 영향

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An air-breathing polymer electrolyte membrane fuel cell is attractive for portable power applications. In order to keep air-breathing PEMFC working in normal, air has to be driven into the cathode of PEMFC by natural convection. But the production of water at the cathode, especially in high current density, blocks the feeding of air to cathode to some extend. Therefore, the performance of the air-breathing PEMFC is remarkably influenced by oxygen supply and water removal, consequently, is affected by the cathode channel configurations indirectly. In this work, with emphasis on the influence on the performance of air-breathing by various channel width, depth and rib width, a coupled 3-D mathematic model was developed, in which the natural convection in the channel and porous media was included, and the concentration over-potential was considered as a result of limited supply of oxygen in the catalyst layer. The model was performed by the FORTRAN language and computational fluid dynamics code. From this calculation, water and species distribution, temperature field and the polarization curves were simulated for the variation of cathode rib width and channel width. Results from this model can perfectly provide insights into many design issues of air-breathing PEMFC.

Keyword: air-breathing PEMFC, mathematic model, natural convection, channel configuration