

Numerical Simulation of SOFC Electrode Polarization Using Three-Dimensional Microstructure Reconstructed by FIB-SEM

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Abstract

A three-dimensional numerical simulation can provide information which cannot be obtained from experiments and be a powerful tool for investigating reaction phenomena at SOFC electrodes. In the present study, a dual-beam focused ion beam-scanning electron microscope is used to reconstruct three dimensional microstructures of the electrode, and electrode polarization is predicted by a lattice Boltzmann method. Ni-YSZ anode and mixed ionic and electronic conducting cathode (LSCF) are investigated. Local three-dimensional distributions of electrochemical potential and current densities inside the electrode microstructure are obtained. Large non-uniformities of potential and current streamlines are presented for the Ni-YSZ anode, while those are drastically improved in the

LSCF cathode. Present method will be an effective tool for investigating local potential fields which affect local reactions, diffusions and physical properties of the SOFC electrodes.