Fuel flow distribution in SOFC stacks revealed by impedance spectroscopy

As SOFC technology is moving closer to a commercial break through, methods to measure the "state-of-health" of operating stacks are becoming of increasing interest. This requires application of advanced methods for detailed electrical and electrochemical characterization during operation. An operating stack is subject to compositional gradients in the gaseous reactant streams, and temperature gradients across each cell and across the stack, which complicates detailed analysis.

An experimental stack with low ohmic resistance from Topsoe Fuel Cell A/S was characterized using Electrochemical Impedance Spectroscopy (EIS). The stack measurement geometry was optimized for EIS by careful selection of the placement of current feeds and voltage probes in order to minimize measurement errors. It was demonstrated that with the improved placement of current feeds and voltage probes it is possible to separate the loss contributions in an ohmic and a polarization part and that the low frequency response is useful in detecting mass transfer limitations.

This methodology can be used to detect possible minor changes in the supply of gas to the individual cells, which is important when going to high fuel utilizations. The fuel flow distribution provides important information about the operating limits of the stack when high electrical efficiency is required.

General information
Publication status: Published
Organisations: Department of Energy Conversion and Storage, Applied Electrochemistry, Mixed Conductors, Haldor Topsoe AS
Contributors: Mosbæk, R. R., Hjelm, J., Barfod, R., Hendriksen, P. V.
Number of pages: 10
Publication date: 2014

Host publication information
Title of host publication: Proceedings of 11th European SOFC and SOE Forum 2014
Publisher: European Fuel Cell Forum
Article number: A0902
ISBN (Electronic): 3-905592-16-9
Research output: Chapter in Book/Report/Conference proceeding › Article in proceedings – Annual report year: 2014 › Research › peer-review