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Jørgensen, P. S.; Bowen, J. R.; Chen, M.

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Characterization of three dimensional transport networks in a long-term tested solid oxide electrolysis cell

P. S. Jørgensen, J. R. Bowen, M. Chen

Solid oxide electrolysis cells (SOEC) are a promising technology for energy conversion and storage. The SOEC cell consists of two electrodes on each side of a dense electrolyte. The electrodes are typically a two- or three-phase porous system, where the solid phases are responsible for conduction of electrons and oxygen ions and the pore phase allows transport of reactants and products to and from the electrochemically active sites. In this work we present a study of three dimensional transport networks in a long-term tested SOEC. The difference in the transport network quality at different cell locations was compared in terms of 3D microstructure parameters calculated from FIB serial sectioning image data. An advanced 3D transport network analysis was performed through simulations and geometrical calculations. Dramatic differences were observed between the gas inlet and outlet in the cell. The obtained 3D transport characteristics correlated well with the measured cell electrochemical performance.