Short Communication

## A Novel Meshing and Calculating Method for Studying the Effect of Irregular Microstructure on the SOFC Composite Electrode Performances

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doi: 10.20964/2019.06.21

Received: 5 February 2019 / Accepted: 15 March 2019 / Published: 10 May 2019

Porous composite electrode is the core component of the solid oxide fuel cell (SOFC) to support the high electrochemical performance; and there are many strict functional requirements, such as the flow diffusivity, three phase boundary sites, ionic and electronic conductivities, thermal conductivity and so on. These are generally considered to greatly depend on the detail microstructure morphology of the electrodes. In the past decades, many theories basing on homogeneous medium hypothesis (i.e., percolation theory) have been developed to study the dependence of effective electrode properties on the microstructure parameters. However, these models neglect the influence of the irregular microstructure details. Although the numerical simulation approach can directly mesh the complex electrode structure to consider the influence of irregular microstructure details, this conventional method can only deal with a very small calculating zone due to the very large calculation ability requirement. In this paper, a novel approach that using regular meshes with irregular properties distribution information is firstly proposed to deal with the influence of the irregular microstructure details. Then, the calculated results based on the proposed method are compared with that obtained by the conventional method to well illustrate the validation of this novel approach.

**Keywords:** Solid oxide fuel cell; Irregular microstructure morphology; Numerical simulation; Porous composite electrode

## FULL TEXT

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