

عنوان مقاله:

A new approach to microstructure optimization of solid oxide fuel cell electrodes

محل انتشار:

چهارمین کنفرانس هیدروژن و پیل سوختی (سال: 1396)

تعداد صفحات اصل مقاله: 12

نویسندگان:

M tafazoli - *mechanical engineering department babol noshirvani university of technology babol iran and Renewable energy organization of Iran (SUNA), Tehran, Iran*

m shakeri - *Mechanical Engineering Department, Babol Noshirvani University of Technology, Babol, Iran*

m riazat - *School of Mechanical Engineering, College of Engineering, University of Tehran, Tehran, Iran*

m baniassadi - *School of Mechanical Engineering, College of Engineering, University of Tehran, Tehran, Iran*

خلاصه مقاله:

Designing optimal microstructures for solid oxide fuel cell (SOFC) electrodes is a subtle task owing primarily to the multitude of the electro-chemo-physical phenomena taking place simultaneously that directly affect working conditions of a SOFC electrode and its performance. In this study, a new design paradigm is presented to obtain a balance between electrochemical sites in the form of triple phase boundary (TPB) density and physical properties in the form of gas diffusivity in the microstructure of a SOFC electrode. The method builds on top of a previously developed methodology for digital realization of generic microstructures with different geometric properties in ionic or electronic conductor grains. The obtained realizations are then used to calculate TPB density and gas transport factor of a SOFC electrode. In the next step, based on the obtained database, a neural network is trained to relate input geometrical parameters to these output properties. The results indicate that the TPB density is less sensitive to the geometry than the gas transport factor. Also the smaller particles in ionic and electronic conductor phase leads to the higher amount of TPB density. The presented methodology is also used to obtain the maximum feasible properties of microstructures and their related geometric characteristics for special target functions like maximum reaction sites and gas diffusivity in realized model. The tradeoff between input and output parameters is another application of this modeling approach which is demonstrated the TPB density and pore transport factor variation versus the rate of grain growth and porosity respectively.

کلمات کلیدی:

Microstructure optimization; Realization of Microstructure; Solid oxide fuel cell

لینک ثابت مقاله در پایگاه سیویلیکا:

<https://civilica.com/doc/642076>



