

عنوان مقاله:

Gadolinia and Samaria Doped Ceria Electrolytes for Intermediate Temperature Solid Oxide Fuel Cells

محل انتشار:

دهمین همایش مشترک و پنجمین کنفرانس بین المللی انجمن مهندسی مواد و متالورژی و انجمن علمی ریخته گری ایران (سال: 1395)

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نویسندگان:

Dorna Heidari - School of Materials Science and Engineering, Shiraz University, Shiraz, Iran

,Sirus Javadpour - professor, School of Materials Science and Engineering, Shiraz University, Shiraz

Qinglin Liu - Senior Research Fellow School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore Singapore

Siew Hwa Chan - Professor, School of Mechanical and Aerospace Engineering, Nanyang Technological University, Singapore, Singapore

خلاصه مقاله:

In order to study the electrolytes with enhanced conductivities, two ceria based electrolytes including samaria doped ceria (SDC), $\text{Sm}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$, and gadolinia doped ceria (GDC), $\text{Gd}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$, are synthesized and characterized. Those samples which are sintered at 1400°C - 1500°C show relative densities as high as 97.7% suggesting that this temperature range leads to high densification of electrolyte as reflected by the high open circuit voltages. From the Arrhenius plots of SDC and GDC conductivities, it can be understood that GDC electrolyte presents lower conductivity compared to SDC, especially those sintered at 1400°C and 1500°C . Moreover, Ni-SDC/SDC/ $\text{Ba}_{0.5}\text{Sr}_{0.5}\text{Co}_{0.8}\text{Fe}_{0.2}\text{O}_{3-\delta}$ (BSCF) and Ni-GDC/GDC/BSCF cells are fabricated and polarization curves are obtained. The thickness of the SDC and GDC electrolytes are identical and about $7.5\ \mu\text{m}$. Based on polarization results, with humidified hydrogen (3 vol% water vapour) as fuel and air as oxidant, the Ni-SDC/SDC/BSCF cell generates open-circuit voltages (OCVs) at 500°C , 550°C , and 600°C as 0.848 V, 0.815 V, and 0.797 V, and maximum power densities (MPDs) of $0.398\ \text{W}\cdot\text{cm}^{-2}$, $0.810\ \text{W}\cdot\text{cm}^{-2}$ and, $1.1\ \text{W}\cdot\text{cm}^{-2}$, respectively. For the Ni-GDC/GDC/BSCF cell, OCVs of 0.829 V, 0.817 V and, 0.792 V and MPDs of $0.368\ \text{W}\cdot\text{cm}^{-2}$, $0.619\ \text{W}\cdot\text{cm}^{-2}$ and, $0.790\ \text{W}\cdot\text{cm}^{-2}$ are achieved at 500°C , 500°C , and 600°C , respectively.

کلمات کلیدی:

Ceria-based electrolyte, Ionic conductivity, Solid oxide fuel cell

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