The Preparation and Electrical Properties of La Doped $\text{Er}_{0.2}\text{Ce}_{0.8}\text{O}_{1.9}$ Based Solid Electrolyte

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doi: 10.20964/2017.08.66

Received: 10 May 2017 / Accepted: 17 June 2017 / Published: 12 July 2017

The present trend is to investigate the co-doping approach in ceria either to improve further the electrical conductivity or sintering property. In this study, nano-structured Er and La co-doped ceria powders have been prepared by a novel solid state reaction method. In all the compositions, total dopant cation concentration has been kept at 0.20 atom fraction having general formulae $\text{Ce}_{0.8}\text{Er}_{0.2-x}\text{La}_x\text{O}_{1.9}$ ($0 \leq x \leq 0.06$). The phase structure, sintering activity, relative density, microstructure, and electrical properties were characterized by X-ray diffraction (XRD), scanning electron microscope (SEM), and AC impedance spectrum analyzer, respectively. All the samples calcined at 800 °C crystallized into cubic fluorite structure with the grain size between 20-25 nm, and La content has little impact on the grain size of the powders. SEM shows that the size of the crystal particles is of relatively uniform without pores with La addition 0.02 sintered at 1250 °C. When the content of La was 0.02, sintered at 1250 °C measured at 800 °C, the conductivity reached the maximum value of $3.5 \times 10^{-2} \text{ S cm}^{-1}$. Erbium and lanthanum co-doping in CeO_2 is a promising electrolyte materials in low-temperature solid oxide fuel cells.

Keywords: $\text{Ce}_{0.8}\text{Er}_{0.2-x}\text{La}_x\text{O}_{1.9}$; La doping; Fluorite structure; Electrical conductivity

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