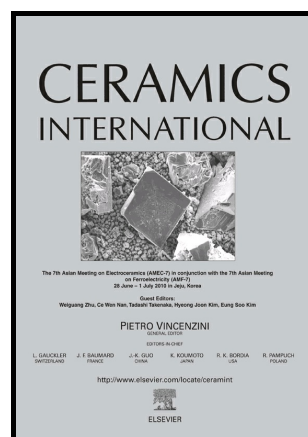


Author's Accepted Manuscript

Electrochemical and Thermal Characterization of Doped Ceria Electrolyte with Lanthanum and Zirconium

Asia Rafique, Rizwan Raza, Nor Anisa Arifin, M Kaleem Ullah, Amjad Ali, Robert Steinberger-Wilckens



www.elsevier.com/locate/ceri

PII: S0272-8842(18)30060-9
DOI: <https://doi.org/10.1016/j.ceramint.2018.01.048>
Reference: CER117180

To appear in: *Ceramics International*

Received date: 21 December 2017
Revised date: 5 January 2018
Accepted date: 7 January 2018

Cite this article as: Asia Rafique, Rizwan Raza, Nor Anisa Arifin, M Kaleem Ullah, Amjad Ali and Robert Steinberger-Wilckens, Electrochemical and Thermal Characterization of Doped Ceria Electrolyte with Lanthanum and Z i r c o n i u m , *Ceramics International*, <https://doi.org/10.1016/j.ceramint.2018.01.048>

This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting galley proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

Electrochemical and Thermal Characterization of Doped Ceria Electrolyte with Lanthanum and Zirconium

Asia Rafique^{1,2,3}, Rizwan Raza¹, Nor Anisa Arifin³, M Kaleem Ullah¹, Amjad Ali¹, Robert Steinberger-Wilckens³

¹Department of Physics, COMSATS Institute of Information Technology, Lahore 54000, Pakistan

²Higher Education Department, Govt. of Punjab, Lahore, 54000, Punjab, Pakistan

³Centre for Hydrogen and Fuel Cell Research, School of Chemical Engineering, University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

Abstract

Nanocomposites electrolytes consisting of La³⁺ and Zr⁴⁺ doped with ceria labelled as La_{0.2}Ce_{0.8}O_{2-δ} (LDC), Zr_{0.2}Ce_{0.8}O_{2-δ} (ZDC) and Zr_{0.2}La_{0.2}Ce_{0.6}O_{2-δ} (ZLDC) have been synthesized via a co-precipitation route. DC conductivity was studied with a four-probe method in the range of temperature 450 to 650 °C and maximum conductivity was found to be $0.81 \times 10^{-2} \text{ S.cm}^{-1}$ (LDC) $> 0.311 \times 10^{-2} \text{ S.cm}^{-1}$ (ZLDC) $> 0.15 \times 10^{-2} \text{ S.cm}^{-1}$ (ZDC) at a temperature of 650 °C, respectively. Further, electric behavior of doped and co-doped ceria electrolytes was investigated by A.C electrochemical impedance spectroscopy (frequency range $\sim 0.1\text{Hz} - 4\text{MHz}$). The phase/structural identification of the material prepared was studied using X-ray diffraction and found ceria to possess a cubic fluorite structure. Scanning electron microscopy (SEM) was carried out to study its morphology and particle size ($\sim 90\text{-}120 \text{ nm}$). Thermal behavior on its change in weight and length with the temperature were studied by thermogravimetric analysis (TGA) and dilatometry respectively. Furthermore, thermal expansion coefficients (TECs) of prepared electrolytes are calculated and found as follows: $13.4 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$, $13.6 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ and $15.3 \times 10^{-6} \text{ }^\circ\text{C}^{-1}$ for LDC, ZDC and ZLDC, respectively, in the temperature range 150– 1150 °C.

Keywords: Doped ceria, Co-doped ceria, Electrolyte, Lanthanum, Zirconium, Ionic conductivity, Thermal expansion coefficient.

Download English Version:

<https://daneshyari.com/en/article/7887888>

Download Persian Version:

<https://daneshyari.com/article/7887888>

[Daneshyari.com](https://daneshyari.com)