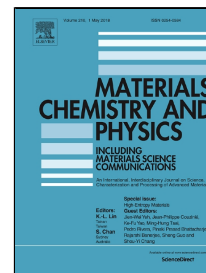


Accepted Manuscript

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PII: S0254-0584(18)30282-7
DOI: 10.1016/j.matchemphys.2018.04.020
Reference: MAC 20515
To appear in: *Materials Chemistry and Physics*
Received Date: 16 January 2018
Revised Date: 29 March 2018
Accepted Date: 05 April 2018

Please cite this article as: Mariah Batool, Maria Sattar, Zuhair S. Khan, Influence of temperature and synthesis dependent changes upon structure, morphology and electrical properties of BaCeO₃-based proton conducting electrolyte, *Materials Chemistry and Physics* (2018), doi: 10.1016/j.matchemphys.2018.04.020

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Influence of temperature and synthesis dependent changes upon structure, morphology and electrical properties of BaCeO₃-based proton conducting electrolyte

Mariah Batool, Maria Sattar, Zuhair S. Khan**

U.S. Pakistan Center for Advanced Studies in Energy (USPCAS-E), National University of Sciences & Technology (NUST), Islamabad, 44000, Pakistan

*Corresponding Authors email addresses: *mariah.batool@gmail.com (Mariah Batool);

*zskhan@ces.nust.edu.pk (Zuhair S. Khan)

Abstract

Current industrialization era stresses upon taking intensive measures to recognize and utilize sustainable, eco-friendly and high energy output generating resources, thus, shifting focus towards proton conducting fuel cells (PCFCs) for use in industrial, residential and transportation sectors. Accordingly, the following research focused on the development of a novel gadolinium-doped electrolyte material i.e. BaCe_{0.59}Zr_{0.2}Y_{0.15}Gd_{0.06}O_{2.97-δ} (BCZYG59) for PCFCs using solid-state and wet-chemical synthesis approach. X-ray Diffraction Analysis (XRD) and Scanning Electron Microscopy (SEM) were carried out for analyzing microstructural morphology, grain-growth and characteristics, densification trends and other phase/structural transformations, whereas, electrical properties were investigated via DC conductivity testing to examine BCZYG59's feasibility as electrolyte. Homogenous cubic perovskite phase for ensuring proton conduction was achieved at 1300°C and 1500°C for BCZYG59 synthesized from wet-chemical and solid-state methods, respectively. These materials showed corresponding conductivity values of $3.20 \times 10^{-4} \text{ S.cm}^{-1}$ and $4.70 \times 10^{-4} \text{ S.cm}^{-1}$ at 650°C in air with the promising prospects of exhibiting greater proton conductivity making it a fairly convincing choice among present-day electrolyte materials.

Keywords

Proton conduction; Ceramic processing; Wet chemical synthesis; Solid-state synthesis; Gd-doped electrolyte.

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