Synthesis and Characterizations of Doped Barium Zirconate – Alkali Carbonate Composite Electrolytes

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Research Article

Keywords: Barium zirconate, composite electrolyte, carbonates, conductivity

Posted Date: April 3rd, 2021

DOI: <https://doi.org/10.21203/rs.3.rs-376924/v1>

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Abstract

Composite materials based on yttrium-doped zirconate ($\text{BaZr}_{0.9}\text{Y}_{0.1}\text{O}_{2.95}$, BZY) and eutectic compositions of alkali carbonates (Li_2CO_3 , Na_2CO_3 and K_2CO_3) are investigated. These materials were characterized by X-ray diffraction, scanning electron microscopy and impedance spectroscopy. This study evidences that the combination of BZY with carbonate promotes the densification and enhances the ionic conductivity which reaches $87 \text{ mS}\cdot\text{cm}^{-1}$ at 400°C for the BZY – LNK40 composite. In addition, the increase of the conductivity as a function of $p\text{H}_2$ suggests that protons are the main charge carriers. The obtained results are interpreted by the transfer of protons from the ceramic to the carbonate phase in the interfacial region.

Full-text

Due to technical limitations, full-text HTML conversion of this manuscript could not be completed. However, the manuscript can be downloaded and accessed as a PDF.

Tables

Due to technical limitations, table 1-2 is only available as a download in the Supplemental Files section.

Figures

Figure 1

XRD patterns of BZY, alkali carbonates and BZY- alkali carbonate composites.

Figure 2

Representative SEM images of BZY – alkali carbonate composites at low (a) and high (b) magnifications.

Figure 3

please see the manuscript file for the full caption

Figure 4

please see the manuscript file for the full caption

Figure 5

please see the manuscript file for the full caption

Figure 6

Conductivity of BZY-LK30 as a function of pH₂ at 500°C.

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