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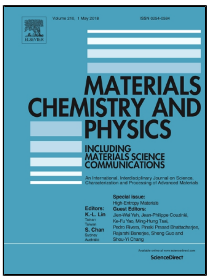

Influence of temperature and synthesis dependent changes upon structure, morphology and electrical properties of BaCeO3-based proton conducting electrolyte

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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. $BaCe_{0.59}Zr_{0.2}Y_{0.15}Gd_{0.06}O_{2.97-\delta}$ (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 3.20×10^{-4} S.cm^{-1} and 4.70×10^{-4} 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.