

# Structural analysis of Ce doped $\text{Ba}(\text{Zr}_{0.8-x}\text{Ce}_x)\text{Y}_{0.2}\text{O}_{3-\delta}$ (x: 0.8-0.1, BZCY) Nanoceramic Powder Series As Proton Conductive Anode for IT-PCFC Applications

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A fuel cell can be described as a system mainly made up of membrane and electrode components which operates on hydrogen or other combustible fuels to generate electric power[1]. Barium zirconium yttrium (called BZY) based ceramic materials are promising candidates for use as anode component for the dehydrogenation of propane in Intermediate Temperature Proton Conductive Fuel Cells (IT-PCFC)[1]. In this work, we present a systematic structural study of the perovskite  $\text{Ba}(\text{Zr}_{0.8-x}\text{Ce}_x)\text{Y}_{0.2}\text{O}_{3-\delta}$  (called BZCY) system with  $x=0-0.7$  in the form of nano-ceramic powders considered as proton conductive anode material for IT-PCFCs[2]. BZCY materials have structural, physical & chemical properties which vary significantly with the amount and ionic radius of the dopant element, in this case Ce. Nano-sized undoped BZY and Ce-doped BZCY samples were systematically synthesized using a sol-gel method[3]. All nano-powders were structurally characterized by means of X-ray Powder Diffraction (XRD) with Rietveld refinement using GSAS[4]. BZCY samples showed two different cubic phases depending upon the Ce and Zr fractions. Ex-situ X-ray Absorption Spectroscopy measurements were performed for both BZY and BZCY, at the Zr, Ce, and Y absorption edge energies. Multiple phases observed in the XRD pattern of BZCY samples were confirmed by isosbestic points obtained in the XANES region of the XAS data. All XANES and EXAFS data were aligned, merged, and normalized in Athena from the IFEFFIT suite[5]. Merged EXAFS data were modeled in Artemis to obtain local structural parameters[5]. Morphological and elemental analysis of the powders was performed by Scanning Electron Microscopy (SEM) with Energy Dispersive X-Ray (EDX) spectroscopy. The total and proton conductivities of Ce doped/undoped BZY samples will be presented and correlated with the structural results.

## References:

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