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Enhanced Sinterability and Chemical Stability of ZnO-added $BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-\delta}$ Electrolyte Material for Proton Conducting Solid Oxide Fuel Cells

M. Naeem Khan[1,2], A. K. Azad[3], Peter Hing[1], J.T.S. Irvine[4]
[1]Centre of Advanced Materials and Energy, University Brunei Darussalam, Jalan Tunku Link, Gadong, Brunei Darussalam
[2]Department of Physics, BUITEMS, Takatu Campus Quetta, Pakistan
[3]Faculty of Integrated Technologies, University Brunei Darussalam, Jalan Tunku Link, Gadong, Brunei Darussalam
[4]Centre for Advanced Materials, School of Chemistry, University of St Andrews, Fife KY16 9ST, United Kingdom
Corresponding Email: Mohammad.Naeem1@buitms.edu.pk

Abstract—Proton conducting oxide $BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-\delta}$ was processed via solid state reaction method. Rietveld analysis confirmed tetragonal symmetry with a=b=6.2190(0), c= 8.8034(4), and V=340.491Å^3. A very high relative density of 99.20% was achieved for ZnO-added BZCYYb after sintering at 1350ºC. The maximum ionic conductivity was $13.25x10^{-3}$ S cm^{-1} at 600ºC in wet 5 vol% H_2/Ar environment. The chemical stability of ZnO-added in pure (100%) CO_2 was roughly enhanced by 200% than the blank sample; however, some small peaks of $BaCO_3$ and CeO_2 were observed in their XRD pattern. Nonetheless, ZnO-added BZCYYb with above properties is an attractive potential electrolyte material for practical applications.

Keywords—Proton Conducting Oxide, Sintering Additive, Relative Density, Ionic Conductivity, Chemical Stability