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Enhanced densification 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

Muhammad Naeem Khan[1], **A K Azad**[2], **Peter Hing**[2] and **John T S Irvine**[3]
[1]Baluchistan University of Information Technology Engineering and Management Sciences (BUITEMS), Pakistan
[2]University Brunei Darussalam, Brunei Darussalam
[3]University of St Andrews, UK

$BaZr_{0.1}Ce_{0.7}Y_{0.1}Yb_{0.1}O_{3-\delta}$ (BZCYYb) proton conducting electrolyte material was processed via solid state reaction method and ZnO was added in various wt. %. 1 wt. % of ZnO was found as the optimum amount for obtaining the maximum densification with optimum shrinkage of 24.23%. An increase in the grain size was observed with increase in the sintering temperature from 1300–1400˚C with a maximum relative density of 99.1% at the sintering temperature of 1350˚C. A maximum value of ionic conductivity of 13.25 x 10^{-3} S cm^{-1} at 600˚C was achieved in humidified 5 vol% H_2/Ar atmosphere. The average value of the thermal expansion co-efficient (α) was measured to be 8.53 x 10^{-6} K^{-1} in the temperature range of 50 – 1100˚C, which is close to the α value for Pr-based cathode materials. The chemical stability of ZnO-added BZCYYb sample in pure CO_2 up to 1200˚C was found about 3 times higher than the blank BZCYYb (without ZnO), however still some small peaks corresponding to $BaCO_3$ and CeO_2 were observed in XRD pattern after chemical stability test. Hence, ZnO-added BZCYYb is a promising electrolyte material for fuel cell applications.

Biography

Muhammad Naeem Khan has completed his PhD at the age of 30 years from University Brunei Darussalam, Brunei. During his PhD studies, he has one year working experience in Prof. John T.S. Irvine Labs, School of Chemistry, University of St Andrews, UK. He is currently working as assistant professor in Baluchistan University of Information Technology, Engineering and Management Sciences (BUITEMS), Quetta, Pakistan. He has published 04 papers in reputed journal. He has one patent as well published in US Patents.

mohammad.naeem1@buitms.edu.pk

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