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A Structural Insight into the Electrical Properties of Dy-Ho co – doped Phase Stabilized Bismuth Oxide Based Electrolytes

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Abstract

A novel Dy-Ho co-doped face centered cubic (FCC) phase stabilized bismuth oxide solid electrolyte has been developed using low temperature auto – ignition method. XRD analysis confirms that complete phase stabilization has been achieved for all co-doped systems. The decrease in lattice parameter for doped system has been attributed to lower ionic radii of dopants Dy^{3+} and Ho^{3+} in comparison with Bi^{3+}. Crystallite size has been found to be maximum and microstrain is minimum for the composition $Bi_{0.88}Dy_{0.06}Ho_{0.06}O_{1.5-\delta}$ having equal proportion of dopant content. The same composition shows higher ionic conductivity at lower temperature regime. The electrical modulus study using Havriliak–Negami (HN) formalism indicates non – Debye type relaxation behavior. Comparable values of different types of activation energies indicate that relaxation, hoping mechanism, dc and ac conduction process follow the same kind of transport mechanism. The scaling of the conductivity and modulus spectra verifies the time–temperature superposition principle (TTSP).

Keywords: Co-doped Bi_2O_3; Rietveld Analysis; Impedance Spectroscopy; Scaling.

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