

High temperature impedance spectroscopy study of non-stoichiometric bismuth zinc niobate pyrochlore.

Abstract

Single phase non-stoichiometric bismuth zinc niobate, $\text{Bi}_3\text{Zn}_{1.84}\text{Nb}_3\text{O}_{13.84}$, was fabricated by a conventional solid state method. The sample was refined and fully indexed on the cubic system, space group $Fd\bar{3}m$ (No. 227), $Z = 4$ with $a = 10.5579(4)$ Å. Electrical characterisation was performed using an ac impedance analyser over the temperature range of 25-850 Å°C and frequency range of 5 Hz-13 MHz. Typical dielectric response is observed in $\text{Bi}_3\text{Zn}_{1.84}\text{Nb}_3\text{O}_{13.84}$ with a high relative permittivity, low dielectric loss and a negative temperature coefficient of capacitance, with the values of 147, 0.002 and -396 ppm/Å°C, at 100 kHz at ambient temperature, respectively. This material is highly resistive, with a conductivity of 10^{-21} O-Å⁻¹cm⁻¹ and a high activation energy of ca. 1.59 eV.

Keyword: Activation energy; Bismuth zinc niobate; Dielectric response; Impedance spectroscopy; Pyrochlore.