

Author's Accepted Manuscript

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PII: S0272-8842(17)32750-5
DOI: <https://doi.org/10.1016/j.ceramint.2017.12.054>
Reference: CER116934

To appear in: *Ceramics International*

Received date: 31 October 2017
Revised date: 7 December 2017
Accepted date: 7 December 2017

Cite this article as: Sushrisangita Sahoo, Sugato Hajra, Manojit De and R N P Choudhary, Resistive, Capacitive and Conducting Properties of $\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3\text{-BaTiO}_3$ Solid Solution, *Ceramics International*, <https://doi.org/10.1016/j.ceramint.2017.12.054>

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Resistive, Capacitive and Conducting Properties of $\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3\text{-BaTiO}_3$ Solid Solution

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Abstract

In the present paper, the effect of addition of a small amount (8 wt %) of barium titanate (BT) on electrical properties of bismuth sodium titanate (BNT) forming a solid solution of a composition $(0.92)(\text{Bi}_{0.5}\text{Na}_{0.5}\text{TiO}_3)+(0.08)(\text{BaTiO}_3)$ (BNT-BT-8) has mainly been reported. The solid solution of BNT-BT-8 was prepared by a cost effective and standard mixed-oxide method. Preliminary structural analysis using X-rays diffraction pattern and data showed the existence of two phases; orthorhombic (major) and tetragonal (minor impurity/secondary) phase. Analysis of scanning electron micrograph and energy dispersive spectructum of the pellet sample reveals the formation of high density with homogeneously distributed grains of varying dimension. The locations, phonon modes statistics, width and intensity of peaks of Raman spectra of BNT-BT-8 was analyzed by Raman spectroscopy and provided some data on molecular structure of the material. The effect of temperature and frequency on some ferroelectric characteristics of the material were studied. The frequency-temperature dependence of electrical characteristical such as impedance of the material was studied by impedance spectroscopy. The electric conductivity follows the Arrhenius equation and provided activation energy at different frequency. The dielectric and impedance spectroscopy suggest the existence of a non-Debye relaxation mechanism in the material.

Keywords: Lead-free ferroelectric, X-ray diffraction, Raman Spectroscopy, Dielectric parameters, impedance , conductivity

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