Influence of Ba^{2+} on Opto-Electric Properties of Nanocrystalline $BiFeO_3$ Multiferroic

Published: 08 October 2018

Volume 48, pages 358–367, (2019) Cite this article

Journal of Electronic Materials

Aims and scope

Submit manuscript

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Abstract

The multiferroic compounds with chemical formula $Bi_{1-x}Ba_xFeO_3$ with x = 0.00, 0.05, 0.10, 0.15, 0.20, and 0.25 were synthesized by sol–gel route. Thermogravimetric and differential thermal analysis were performed on a pure $BiFeO_3$ sample to know the required annealing temperature. Its structural, morphological, optical, electrical and dielectric properties were studied systematically by standard techniques. X-ray diffraction (XRD) and transmission electron microscopy techniques were employed to study the structure and phase, as well as the

morphology of the samples respectively. The transition from the distorted rhombohedral perovskite (ABO_3) to hexagonal crystal structure was revealed by XRD pattern with Ba^{2+} substitution having R3c space group. UV-visible absorption spectra show that the absorption edge shifts to lower wavelength with increasing Ba^{2+} concentration. DC electrical resistivity measurements revealed a linear decrease in resistivity carried out in the temperature range of 343–1073 K using a standard two probe method. The dielectric parameters such as dielectric constant (ε') and loss tangent ($\tan\delta$) were measured at room temperature in the frequency range 50 Hz–5 MHz, which was found to decrease with increasing frequency.

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Acknowledgments

Author MVS is thankful to Solapur University, Solapur for providing XRD characterization, IIT Mumbai for providing TGA-DTA and TEM facilities and North Maharashtra University, Jalgaon for providing UV–Vis measurements.

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Shisode, M.V., Humbe, A.V., Kharat, P.B. *et al.* Influence of Ba^{2+} on Opto-Electric Properties of Nanocrystalline $BiFeO_3$ Multiferroic. *J. Electron. Mater.* 48, 358–367 (2019). https://doi.org/10.1007/s11664-018-6715-6

Received	Accepted	Published
10 May 2018	28 September 2018	08 October 2018

Issue Date
15 January 2019

DOI
https://doi.org/10.1007/s11664-018-6715-6

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Keywords

Multiferroic sol–gel TG–DTA SAED electrical properties