

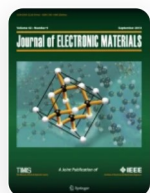
# Influence of Ba<sup>2+</sup> on Opto–Electric Properties of Nanocrystalline BiFeO<sub>3</sub> Multiferroic

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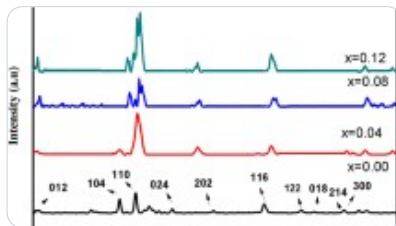
## Abstract

The multiferroic compounds with chemical formula Bi<sub>1-x</sub>Ba<sub>x</sub>FeO<sub>3</sub> 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<sub>3</sub> 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<sub>3</sub>) to hexagonal crystal structure was revealed by XRD pattern with Ba<sup>2+</sup> substitution having R3c space group. UV-visible absorption spectra show that the absorption edge shifts to lower wavelength with increasing Ba<sup>2+</sup> 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 ( $\epsilon'$ ) 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.

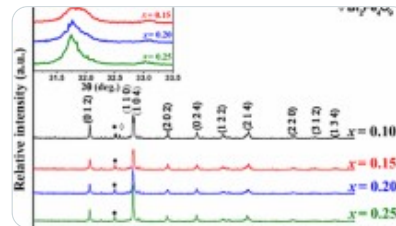
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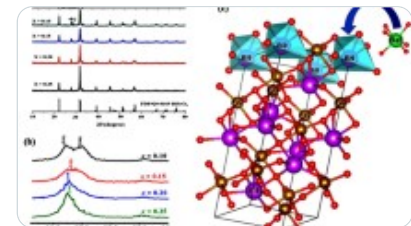
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## References

1. N.A. Spaldin, S.W. Cheong, and R. Ramesh, *Phys. Today* 63, 38 (2010).

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2. M.A. Nazir, M. Ul-Islam, I. Ali, H. Ali, B. Ahmad, S.M. Ramay, N. Raza, M.F. Ehsan, and M.N. Ashiq, *J. Electron. Mater.* 45, 1065 (2016).

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3. S. Ghosh, S. Dasgupta, A. Sen, and H.S. Maiti, *J. Am. Ceram. Soc.* 88, 1349 (2005).

[Article](#) [Google Scholar](#)

4. C. Chen, J. Cheng, S. Yu, L. Che, and Z. Meng, *J. Cryst. Growth* 291, 135 (2006).

[Article](#) [Google Scholar](#)

5. Y. Hu, L. Fei, Y. Zhang, J. Yuan, Y. Wang, and H. Gu, *J. Nanomater.* 2011, 27 (2011).

[Article](#) [Google Scholar](#)

6. T.D. Rao, T. Karthik, and S. Asthana, *J. Rare Earths* 31, 370 (2013).

[Article](#) [Google Scholar](#)

7. B. Bhushan, A. Basumallick, S.K. Bandopadhyay, N.Y. Vasanthacharya, and D. Das, *J. Phys. D* 42, 065004 (2009).

[Article](#) [Google Scholar](#)

8. Z.X. Cheng, X.L. Wang, Y. Du, and S.X. Dou, *J. Phys. D* 43, 242001 (2010).

[Article](#) [Google Scholar](#)

9. X. Deng, J. Huang, Y. Zhang, W. Cai, and C. Fu, *Ferroelectrics* 478, 11 (2015).

[Article](#) [Google Scholar](#)

10. R. Mahbub, T. Fakhrol, M.F. Islam, M. Hasan, A. Hussain, M.A. Matin, and M.A. Hakim, *Acta Metall. Sin. Engl.* 28, 958 (2015).

[Article](#) [Google Scholar](#)

11. M.V. Shisode, D.N. Bhojar, P.P. Khirade, and K.M. Jadhav, *J. Supercond. Novel Magn.* 31, 1 (2017).

[Google Scholar](#)

12. M.M. El-Desoky, M.S. Ayoua, M.M. Mostafa, and M.A. Ahmed, *J. Magn. Magn. Mater.* 404, 68 (2016).

[Article](#) [Google Scholar](#)

13. P.B. Kharat, M.V. Shisode, S.D. Birajdar, D.N. Bhojar, and K.M. Jadhav, in *AIP Conference Proceedings*, p. 050122 (2017).

14. P.P. Khirade, S.D. Birajdar, A.V. Raut, and K.M. Jadhav, *J. Electroceram.* 37, 110 (2016).

[Article](#) [Google Scholar](#)

15. P.P. Khirade, S.D. Birajdar, A.V. Humbe, and K.M. Jadhav, *J. Electron. Mater.* 45, 3227 (2016).

[Article](#) [Google Scholar](#)

16. A.R. Chavan, R.R. Chilwar, P.B. Kharat, and K.M. Jadhav, *J. Supercond. Novel Magn.* 1 (2018).
17. A. Manikandan, L.J. Kennedy, M. Bououdina, and J.J. Vijaya, *J. Magn. Magn. Mater.* 349, 249 (2014).

[Article](#) [Google Scholar](#)

18. S. Chauhan, M. Kumar, and S.C. Katyal, in *AIP Conference Proceedings*, (2016), p. 130029.
19. S. Chauhan, M. Kumar, S. Chhoker, S.C. Katyal, H. Singh, M. Jewariya, and K.L. Yadav, *Solid State Commun.* 152, 525 (2012).

[Article](#) [Google Scholar](#)

20. A.V. Raut, P.P. Khirade, A. Humbe, S.A. Jadhav, and D.R. Shengule, *J. Supercond. Novel Magn.* 29, 1331 (2016).

[Article](#) [Google Scholar](#)

21. A.V. Humbe, A.C. Nawle, A.B. Shinde, and K.M. Jadhav, *J. Alloys. Compd.* 691, 343 (2017).

[Article](#) [Google Scholar](#)

22. A. Azam, A. Jawad, A.S. Ahmed, M. Chaman, and A.H. Naqvi, *J. Alloys Compd.* 509, 2909 (2011).

[Article](#) [Google Scholar](#)

23. J.S. Kounsalye, P.B. Kharat, M.V. Shisode, and K.M. Jadhav, *J. Mater. Sci. Mater. Electron.* 28, 17254 (2017).

[Article](#) [Google Scholar](#)

24. A.P. Ramirez, M.A. Subramanian, M. Gardel, G. Blumberg, D. Li, T. Vogt, and S.M. Shapiro, *Solid State Commun.* 115, 217 (2000).

[Article](#) [Google Scholar](#)

25. S. Kumar, S. Supriya, P. Kumar, and M. Kar, in *AIP Conference Proceedings*, p. 020578 (2016).

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