

## AC Conductivity Studies Of La Doped BaFeO<sub>3</sub> Nanocrystalline Systems

A. Sendil Kumar<sup>1,#</sup>, Slavia Deeksha D'Souza<sup>2</sup>, Kotla Surya Rohith<sup>3</sup>, Anil K Bhatnagar<sup>1,4,\*,@</sup>

<sup>1</sup>School of Physics, University of Hyderabad, Hyderabad, Telangana, 500 046, India.

<sup>2</sup>Department of Physics, National Institute of Technology Warangal, Telangana State-506004, India

<sup>3</sup>Department of Physics and Astronomy, National Institute of Technology Rourkela, Odisha-769008, India

<sup>4</sup>School of Engineering Sciences & Technology, University of Hyderabad, Hyderabad, Telangana, 500 046, India.

#,@ Corresponding authors: [sendilphy@gmail.com](mailto:sendilphy@gmail.com) and [anilb42@gmail.com](mailto:anilb42@gmail.com)

The iron containing perovskite oxides and related oxides with high electrical conductivity are used for electrocatalysts and photoelectrode applications [1, 2]. BaFeO<sub>3</sub> (BFO) is one of the oxides where iron has rare valence state of +4. Synthesizing stoichiometric BFO remains a challenge for researchers and depends on preparation conditions. Stoichiometric BFO stabilizes in either one of Cubic, Rhombohedral and Tetragonal structures. Whenever non-stoichiometry exists then BFO stabilizes in either hexagonal or orthorhombic structure [3]. Oxygen vacancies play an important role in stabilizing the structure and other physical properties. The conductivity is determined by the interaction between the 'Fe' cation and the oxygen when the carrier density is large. When the interaction is small then carriers move towards the lattice through hopping mechanism. The distance between Fe-O-Fe and degree of overlapping (Fe and O) in BFO decides the conductivity [4, 5]. Therefore altering the distance between Fe cations and lattice parameters are depends on oxygen content. Small percentage of Lanthanum is substituted in place of 'Ba' to reduce the Fe-O-Fe distance and study the influence of 'La' on conductivity in this work. The auto ignition method is used to synthesize samples where high purity precursors are used for the synthesis. Structurally well characterized samples are chosen to do temperature dependent impedance studies. With higher amount of 'La' substituted system shows increase in AC Conductivity when temperature increases. These results and interpretation of the same will be presented.

[1]. Y. Matsumoto, J. Kurimoto, and E. Sato, *J. Electroanal. Chem.* **102**, (1979) 77.

[2]. Y. Matsumoto, S. Yamada, T. Nishida, and E. Sato, *J. Electrochem. Soc.* **127**, (1980) 2360.

[3]. F. Iga, Y. Nishihara, T. Katayama, K. Murata, and Y. Takeda, *J. Magn. Mater.* **104-107**, (1992)1973.

[4]. J. B. Goodenough, *J. Appl. Phys.* **37**, (1966) 1415.

[5]. Jukichi Hombo, Yasumichi Matsumoto and Takeo Kawano, *Journal of Solid State Chemistry* **84**, (1990) 138.