ISSN No : 1006-7930

Studies on Dangling bonds effect on coupling nature of $BiFeO_3$ multiferroic nanoparticles

B. Jaya Prakash[1a]*, & K. Srinivasa Rao[2b]
[1]Department of Physics, B.T. College, Madanapalle-517325, A.P., INDIA.
[2]Department of Physics, Govt. Degree College, Mandapeta -533308, A.P., INDIA.
[a]jpsvut@gmail.com

Key words: Coupling coefficient, Dangling bonds, RT Multiferroic materials, Chemical co-precipitation

Abstract. Room temperature multiferroic materials plays significant role for developing multifunctional devices for advances in science and technologies. Effective Utility of these materials depends on mutually control between by the ferroric orders and its coupling coefficient. Bismuth ferrite has gained significant importance due to its room temperature ferroic orders.

Study of the occurrence of Dangling bond and its impact on mechanical, chemical and its physical properties are gained much significance at nano scale. Occurrence dangling bonds generate a high local energy, influences much on lattice distortion and tilting of octahedral symmetry prevoskite Bismuth ferrite nanoparticles. Which intern influences greatly on multiferroic properties of and it's coupling nature material. Bismuth ferrites are synthesized by chemical co-precipitation method to achieve nano size particles and samples are sintered at different temperatures to study variation of coupling coefficient to optimize best coupling between ferroic orders based on dangling bond effect and free surface energy of the sample. For optimized sample, Characterizations has been carried out such as TG-DTA, XRD, HR-SEM, P-E hysteresis loop M-H hysteresis loop.

Introduction. Multifunctional materials have been emerging with several useful features in the same substance and displaying interestingly certain new phenomena. Such materials are the most important for future technological devises applications [1-3]. In generally, conventional materials, ferroic orders exhibited by different materials and are used in different applications separately [4, 5]. But existence of all ferroic orders in a material with single phase becomes scientific relevance in the present days for the development of multifunctional devises applications such as such as generation of multistate memories, spintronics, sensors and microelectronics devices [6, 7]. The uniqueness of these materials lies on possibility of simultaneous exploitation of their magnetization and electrical polarization state causes mutually tenability or controllability (coupling nature) over each other [8]. Such coupling coefficient of the multiferroic materials are may influenced by so many factors such as composition of the material, crystal structural, phase change, impurities, nature of ferroic orders, occurring of the ferroelectricity and magnetism with temperature and arise from different mechanisms, direction of occurring frroic orders, and dangling bond due to point defect, particle size sintering time, sintering temperature.

At present, gigantic effort has been made to explore the room temperature multiferroic materials in the past few years. Among the multiferroic materials, $BiFeO_3$ has gained great importance to realizing its technological applications at room temperature. In the present study, effect of dangalling bonds effect defect on coupling nature of the $BiFeO_3$ materials with different sintering temperatures has been analyzed with help of thermodynamic parameters. $BiFeO_3$ nanoparticles are prepared by co-precipitation method and its structural, magnetic, electrical are studied to understand the mutually controllability between ferroic orders [9].

Principal
Govt. Degree College
MANDAPETA - 533308