Structural and Dielectric Properties in Nd^{3+} Doped Bi-Cobaltite Nanoparticles

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New electronic materials have become inevitable due to ever increasing demand of efficient electronic and electrical devices. Search for new energy efficient materials is always of interest [1, 2]. In the present study, ac electrical properties of pure and doped bismuth cobaltite nanoparticles are studied. These materials find their applications not only in electronic devices but in electrical power generation like thermoelectricity and fuel cells. The nominal composition studied was $BiCa_{2-x}Nd_xCoO_6$ (where x=0.0 - 0.1). Samples were synthesized by a simplified method namely Without Water and Surfactants (WOWS) sol-gel method. The structural analysis was done using X-ray diffractometer. The lattice constants (a, b, c) were determined using X-Rays Diffraction (XRD) data. The crystallite size was in the range of 25-37nm. XRD graphs showed that all the samples were monoclinic and were phase pure. The crystallite size first decreased and then increased with increase in the Nd^{3+} substitutions. AC electrical properties such as dielectric constant (ε') and dielectric loss (tanδ) were measured as a function of frequency and temperature as show in **Fig 1**. The frequency range was from 20Hz to 3MHz and the temperature ranges from room to 600°C. The dielectric behavior is very interesting, it increased with temperature as well as with increase in Nd^{3+} content and decreased with frequency. This could be explained on the basis of Maxwell-Wagner polarization model [3].

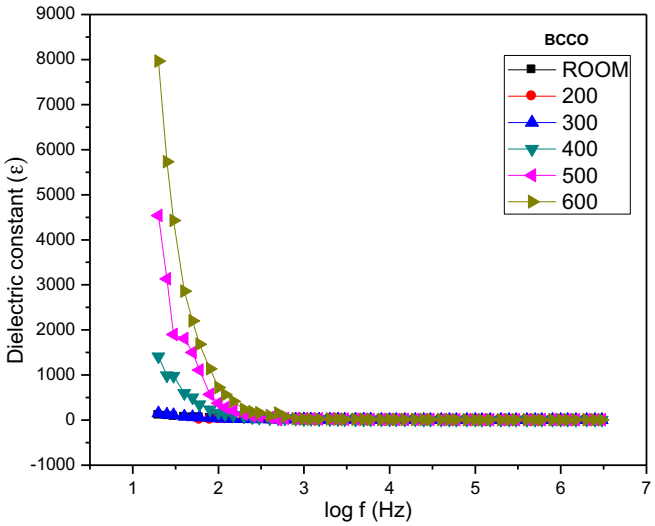

Fig 1: Dielectric constant as a function of frequency for $BiCa_2CoO_6$ (BCCO) sample.

References

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