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Study of Structural and Electrical Transport Properties of $YBaCuFeO_5$ Multiferroic

K.L. ROUTRAY and D. BEHERA†

Department of Physics and Astronomy, NIT Rourkela 769 008
Email: dbehera@nitrkl.ac.in

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Abstract : Double perovskite oxide $YBaCuFeO_{5+\delta}$ samples, were sintered by a solid state reaction technique. Crystal structure was analysed in the space group P_{4mm} by x-ray diffraction and further confirmed by Rietveld refinement using full-prof-suit program. The fully ordered structure was obtained in which the Fe^{3+} and Cu^{2+} ion have occupied distinct crystallographic sites. Microstructural investigation has been carried out with scanning electron microscope (SEM) which revealed randomly oriented, non-uniform grains and a certain amount of intergranular porosity in the sample. The electrical behaviour of the samples has been studied over a wide range of temperature and frequency using CIS technique. RC model circuits are connected in series in order to analyse the electrical and dielectric behaviour of prepared $YBaCuFeO_{5+\delta}$. the data obtained is described by RC circuit representing the grain boundary resistance (R_{gb}) and capacitance (C_{gb}) in the temperature regime 25^{o} C- 175^{o} C and frequency range 1Hz- 1 Mhz. A Debye character was observed in the impedance behaviour in its frequency dependence. It was observed that the resistance of the material suddenly drops with rise in temperature. Relaxation mechanism of charge carriers was confirmed by modulus study. A single relaxation was observed in the prescribed temperature and frequency range and was identified due to extrinsic sample-electrode interface conduction effect.

Keywords : Multiferroic, Magnetism-driven ferroelectricity, Double perovskite

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