Influence of Sintering Temperature on Structural, Dielectric and Electrical Properties of NBT-BCT Lead-free Piezoelectric Ceramics

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In recent years the lead free piezoelectric ceramics have gained much attention due to their crucial applications in high temperature piezoelectric device. Among lead free piezoelectric ceramics, NBT-BT composite is considered most suitable material for high temperature piezoelectric devices. In this study the lead free piezoelectric ceramics 0.94NBT-0.6BCT was synthesized by high temperature conventional solid state reaction method. The phase formation was confirmed by X-ray diffraction analysis (XRD). The dielectric measurements were measured as a function of temperature from room temperature to 500°C at different frequencies 20 Hz to 1 MHz. The broad peaks in dielectric constant demonstrate the relaxor behavior. The transition temperature was found to increase from 300°C to 314°C with increasing sintering temperature from 1100°C to 1200°C. The dielectric constant showed the dielectric dispersion at low frequency and high temperature. Dielectric loss was found minimum at the sintering temperature of 1150°C and increased on increasing the sintering temperature. The modified Curie-Weiss law was applied to check the relaxor behavior of NBT-BCT ceramics. The diffusivity was found to increase with increasing sintering temperature. The effect of sintering temperature on dielectric properties was studied in this study.