Investigation of Multiferroic properties of the Co doping SrBi$_2$Nb$_2$O$_9$

WILLIAM PEREZ, NORA ORTEGA, ASHOK KUMAR, RAM KATIYAR, University of Puerto Rico — Multiferroics (MF) are novel class of next generation multifunctional materials, however there are very few single-phase MF materials existing in nature. Thin films (TF) of (Sr$_x$Co$_{1-x}$)Bi$_2$Nb$_2$O$_9$ (SCBN) with $x = 0, 0.05, 0.1, 0.15, 0.2, 0.25, 0.3$ with thickness $\sim 400$ nm were fabricated from individual SCBN targets on Pt/Ti/SiO$_2$/Si substrate by pulsed laser deposition technique. The x-ray diffraction studies revealed orthorhombic structure of SCBN for up to 20% Co doped TF without any phase segregation, the splitting in (200) peak was observed above 25% of Co doping. The room temperature (RT) Raman spectra of SCBN TF showed SrBi$_2$Nb$_2$O$_9$ peaks in all compositions, however additional modes appeared in the 600-800 cm$^{-1}$ frequency region. The dielectric constant of all SCBN films showed linear frequency dispersion above 1 kHz, and their values are in the range of 400 to 650 at 1 kHz. An increase in tangent loss from $\sim 0.040$ to 0.135 at 1 kHz was observed with increase in Co concentration. All SCBN TF show well defined hysteresis loop with remanent polarization of about 16 $\mu$C/cm$^2$. However, less saturation in the ferroelectric loop was observed with increase of Co content. Both magnetic and magneto-electric behavior of TF along with the ferroelectric properties will be discussed.

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