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Design and characterization of d0 magnetization based materials as ferroelectric materials for the application of random access memory (RAM) devices

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Multiferroic materials simultaneously present both ferroelectric and spin orders, which enable them to have potential applications in both magnetic and ferroelectric devices. So, the development of such type of material, which has magnetoelectric properties in same phase at room temperature, is the milestone for modern technology. These materials have potential applications in memory devices where one can write ferroelectrically and read magnetically or vice versa. We report the multiferroic properties of polycrystalline homogeneous $Bi_{4-x}Nd_xTi_3O_{12}$ (BNdT) ferroelectric thin films sandwiched in Pt electrodes by chemical solution deposition. Dense and uniform BNdT films were achieved by rapid thermal annealing the spin-on films at 700°C for 3 min in oxygen environment. All the samples exhibited well-saturated hysteresis loops with remenant polarization ($2P_r$) increasing from 36.22 μC/cm^2 (x=0.0) to 109.86 μC/cm^2 (x=0.1), respectively, while the coercive field ($2EC$)=64.6 kV/cm remained unchanged for all compositions at room temperature. Polarization offset was observed in the compositionally graded ferroelectric thin films as a function of temperature. Polarization offset was notable after 100°C and increased with increasing temperature which may be related to thermionic charge injection, which is asymmetric to top and bottom electrodes.

Biography

Khalid Mujasam Batoo, received his PhD in Applied physics from Aligarh Muslim University, India on magnetic oxide materials in 2008. He has worked as Project scientist at Inter Nuclear Acceleratore center, New Delhi, India (2007-2010). He is presently Assistant Professor at King Abdullah Institute for Nanotechnology, King Saud University, Riyadh, Saudi Arabia. He is a nano-physicist, with research mostly at the intersection flanked by Magnetic nanomaterials, Spintronics, Multiferroic Magnetoelectric Materials, Magnetic multilayer's (MTJs as GMR) and Magnetic layered double hydroxide (MLDH). As principal investigator, he has to his credit a number of projects of international repute which comprise research work on modifications induced in structural, electrical and magnetic properties of spinel nano ferrites; Design and characterization of nano composite multiferroic materials for new generation Read Access Memory (RAMs) devices; Interface magnetization and structure in magnetic oxide nano composites and synthesization of doped SnO2-based materials and their subsequent irradiation with swift heavy ions. He has authored more than 40 research papers published in peer reviewed Journals of International commendation. Besides presenting his work in a number of scientific conventions, Dr. Khalid has written and lectured widely on many aspects of nanotechnology as an invited speaker.

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