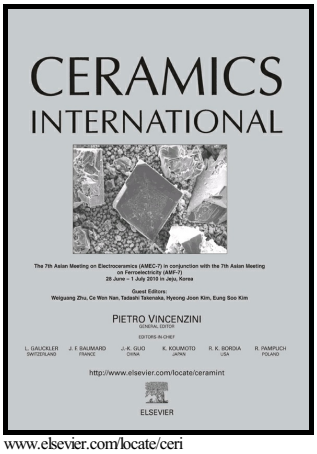

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Effects of Nd^{3+}-substitution for Bi-site on the leakage current, ferroelectric and dielectric properties of $Na_{0.5}Bi_{0.5}TiO_3$ thin films

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Abstract

Perovskite $Na_{0.5}(Bi_{1-x}Nd_x)_{0.5}TiO_3$ (x = 0, 0.01, 0.03, 0.05; xNd: NBT) ferroelectric films were synthesized on indium tin oxide (ITO)/glass substrates via chemical solution deposition. Structural characterization shows the similar phase-pure perovskite structures in all the films and gradually decreased grain sizes with Nd^{3+} doping amount increasing. For all the films, the leakage behaviors are dominant by the Ohmic conduction in low electric field region and interface-limited Fowler-Nordheim tunneling mechanism in high electric field region. Additionally, the space-charge-limited conduction is involved in 0.03Nd: NBT sample. Compared with the sample of x = 0, the resistivity can be improved through Nd^{3+}-substitution in NBT. Enhanced ferroelectricity can be obtained from the dynamic polarization-electric field test, and the reversible domains switching in film can be confirmed by static dielectric constant-electric field measurement. Especially, the 0.03Nd: NBT possesses optimal electrical performances with a large remanent polarization (P_r = 26.7 μC/cm^2) and a high dielectric tunability (19.6 % at 100 kHz).

Keywords: Perovskite; Thin film; Cation substitution; Microstructure; Electrical property

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