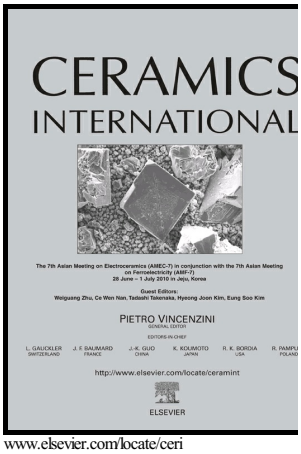

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Effect of Fe substitution on microstructure and properties of bismuth titanate thin films

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Abstract : $Bi_4Ti_3O_{12}$ and Fe doped $Bi_4Ti_3O_{12}$ ($Bi_4Ti_{2.94}Fe_{0.03}O_{12}$, BTFO) thin films were prepared on FTO/glass (SnO_2:F) substrates by the sol-gel method. The effects of Fe doping on the microstructures, dielectric and ferroelectric properties of the films were investigated. X-ray diffraction analyses reveal a lattice distortion for the BTFO thin film. At an applied field of 500 kV/cm, the leakage current density of the BTFO thin film is 1.15×10^{-5} A/cm^2, which is about 2 orders of magnitude lower than that of the pure BTO thin film (2.73×10^{-3}A/cm^2). The electrical conduction mechanisms of the BTO and BTFO thin films are dominated by Ohmic conduction at the low electric field region and gradually transite to space-charge-limited conduction at the higher electric field region. The dielectric constant and dielectric loss of BTFO thin film at 100 kHz are 313 and 0.05, respectively. The BTFO thin film shows an enhanced ferroelectric property (P_r = 30.88 μC/cm^2), which is mainly attributed to the lower leakage current density, the distorted lattice structure and the improved surface microstructure.

Keywords: Bismuth titanate; Ferroelectric; Dielectric; Leakage current; Sol-gel method