Ferroelectric Ti-doped SrBi2Nb2O9 thin films obtained using a microwave oven

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Abstract

Ferroelectric SrBi2Nb2O9 (SBN) thin films doped with titanium were prepared by the polymeric precursor method. The films were deposited by spin coating onto Pt/Ti/SiO2/Si substrate and crystallized using a domestic microwave oven. An element with high dielectric loss, a SiC susceptor, was used to absorb the microwave energy and transfer the heat to the film which was put directly on the susceptor. With the application of microwave energy it is possible to obtain dense and homogeneous films with good electric properties, low investment and short time. Doped-SBN solution was prepared by adding 10 mol% in titanium to the SBN precursor solution. The films were treated in a microwave oven at 600, 650 and 700 oC for 10 min with 230 oC/min heating rate. Structural and microstructural characterizations were performed by X-ray diffraction and atomic force microscopy. Fluorite phase was observed for the SBN film treated at 600 oC, however, when it was treated at 650 and 700 oC, the perovskite SBN phase was verified. A preferential orientation in the 00l direction was observed for these films. The films treated at 600 oC showed a C-V typical butterfly-like curve, the dielectric constant and dielectric loss, at 100 KHz, were 81 and 0.07, and the remanent polarization and coercive field, measured at 60 Hz, were 2.8 microC/cm2 and 63 KV/cm, respectively. The films treated at 650 oC presented a paraelectric behavior which can be attributed to the preferential orientation.