

Ferroelectric behavior of pure and La doped barium bismuth-titanate ceramics

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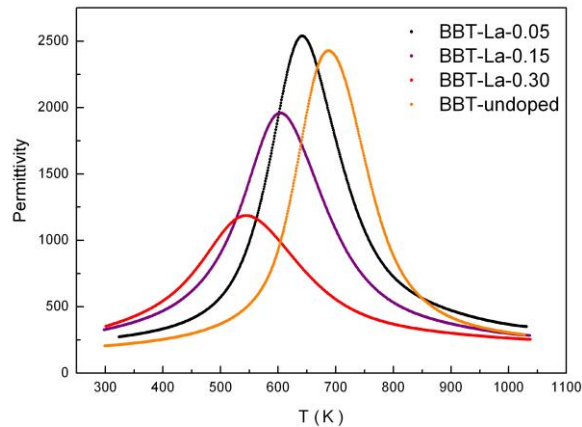
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Barium bismuth titanate ($\text{BaBi}_4\text{Ti}_4\text{O}_{15}$ -BBiT) is a member of the Aurivillius bismuth-based layer-structure perovskites. The BBT grains possess plate-like shape with larger surfaces parallel to the $(\text{Bi}_2\text{O}_2)^{2+}$ layers. Their intrinsic electrical properties are anisotropic, with the maximum value of conductivity and the major component of spontaneous polarization parallel to the $(\text{Bi}_2\text{O}_2)^{2+}$ layers. As a result, properties of the polycrystalline materials are strongly affected by their microstructure, especially by the orientation of the plate-like grains and by the length-to-thickness ratio of the grains [1]. The disadvantage of BBiT materials for high-temperature piezoelectric application is their relatively high conductivity [2]. The aim of our investigation is to find out how lanthanum (La^{3+}) as dopant influence on electrical properties and microstructure in BBiT ceramics.

BBT powders, pure and doped with 0.05, 0.15 and 0.30 mol of lanthanum, were prepared through conventional solid state reaction. BBT ceramics were obtained by sintering at temperatures ranging from 1130 °C to 1150 °C for 1h depending on the composition. On $\text{BaBi}_{4-x}\text{La}_x\text{Ti}_4\text{O}_{15}$ (BBLT) ceramics ($x=0, 0.05, 0.15, 0.30$ mol) were measured permittivity from 20 Hz to 1 MHz in wide range of temperatures (32 °C–750 °C). Obtained results were analyzed in the frame of the influence of the grain and grain boundaries contribution to the dielectric behavior through impedance spectroscopy. The temperature dependence of dielectric constant at 100 kHz for pure and La doped BBiT ceramics is showed on figure below. It is indicated that the temperature of dielectric constant maximum (T_m) of BBLT specimens significantly decreases with the increase of lanthanum content. The changes of T_m are attributed to the changes of crystal structure for BBLT specimens, which indicated that the La^{3+} have entered into the lattice of BBT.



The temperature dependence of dielectric constant at 100 kHz

References

- [1] T. Jardiel, A.C. Caballero, M. Villegas, J. Ceram. Soc. Jpn., 116 [4] 511-518 (2008)
- [2] D. Makovec, I. Pribosic, Z. Samardzija, M. Drofenik, J. Am. Ceram. Soc., 84 [11] 2702-704 (2001)