

Enhanced Thermal Stability of Dielectric and Energy Storage Properties in 0.4BCZT-0.6BTSn Lead-Free Ceramics Elaborated by Sol-Gel Method

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Abstract : In the present paper, structural, dielectric, ferroelectric, and energy storage properties of pure perovskite lead-free BCZT, BTSn, and BTSn-BCZT ferroelectric ceramics have been investigated. Rietveld refinement of XRD data confirms the coexistence of the rhombohedral and orthorhombic phases at room temperature in the composite BCZT-BTSn ceramic. Remarkably, an improved recoverable energy density of 137.86 mJ/cm³ and a high energy storage efficiency of 86.19 % at 80°C under a moderate applied electric field of 30 kV/cm were achieved in the designed BCZT-BTSn ceramic. Besides, the sample exhibits excellent thermal stability of the energy storage efficiency (less than 3%) in the temperature range of 70 to 130 °C under 30 kV/cm. Such results make the pb-free BCZT-BTSn ferroelectric ceramic a very promising potential matrix for energy storage capacitor applications.

Keywords : sol-gel, ferroelectrics, lead-free, perovskites, energy storage

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