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Electric field induced phase transition and accompanying giant poling strain in lead-free $\text{NaNbO}_3\text{-BaZrO}_3$ ceramics

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Abstract:

A series of phase transitions in $(1-x)\text{NaNbO}_3\text{-}x\text{BaZrO}_3$ ((1-x)NN-xBZ) ceramics was observed from antiferroelectric orthorhombic phase to ferroelectric orthorhombic phase and finally into ferroelectric rhombohedral phase with increasing x . An electric field induced irreversible phase transition was found in different compositions, irrespective of their virgin phase structures. Particularly, an antiferroelectric orthorhombic phase is irreversibly transformed into a ferroelectric monoclinic phase within $0.02 \leq x \leq 0.05$, leading to a giant poling strain of $\sim 0.58\%$. This is much larger than that observed in ferroelectric orthorhombic ($0.06 \leq x \leq 0.07$) and rhombohedral phases ($0.08 \leq x \leq 0.11$) suffering from an irreversible ferroelectric-ferroelectric (monoclinic) phase transition. The synchrotron x-ray diffraction and the measurement of longitudinal and transverse strains suggest that this irreversible phase

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