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Title: Field induced metastable ferroelectric phase in
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Field induced metastable ferroelectric phase in $\text{Pb}_{0.97}\text{La}_{0.03}(\text{Zr}_{0.90}\text{Ti}_{0.10})_{0.9925}\text{O}_3$ ceramics

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Abstract

$\text{Pb}_{0.97}\text{La}_{0.03}(\text{Zr}_{0.9}\text{Ti}_{0.1})_{0.9925}\text{O}_3$ (PLZT 3/90/10) ceramics prepared by solid-state reaction with the compositions near the antiferroelectric/ferroelectric (FE/AFE) phase boundary were studied. From the polarization–electric field $P(E)$ dependence and *ex situ* X-ray study, an irreversible electric field induced AFE-to-FE phase transition is verified at room temperature. Dielectric and *in situ* temperature dependent X-ray analysis evidence that the phase transition sequence in PLZT 3/90/10-based ceramics can be readily altered by poling. A first order antiferroelectric-paraelectric (AFE-PE) transition occurred at $\sim 190^\circ\text{C}$ in virgin sample and at $\sim 180^\circ\text{C}$ in poled sample. In addition, a FE-to-AFE transition occurs in the poled ceramic at much lower temperatures ($\sim 120^\circ\text{C}$) with respect to the Curie range ($\sim 190^\circ\text{C}$). The temperature-induced FE-to-AFE transition is diffuse and takes place in a broad temperature range of $72\text{--}135^\circ\text{C}$. The recovery of AFE is accompanied by an enhancement in the piezoelectric properties.

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