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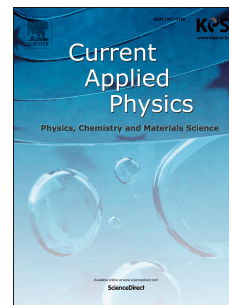
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Effect of Sn substitution on the elastic anomalies and phase transition behaviors of antiferroelectric PbHfO<sub>3</sub> single crystals studied by Brillouin scattering

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Abstract

The phase transition sequence of a PbHf<sub>0.7</sub>Sn<sub>0.3</sub>O<sub>3</sub> single crystal was investigated by using Brillouin spectroscopy. The longitudinal acoustic mode showed three distinct changes at ~370 K, ~455 K and ~495 K which corresponded to the antiferroelectric 1 → antiferroelectric 2 → intermediate → paraelectric phase transitions upon heating. The paraelectric phase was characterized by softening acoustic mode, increasing acoustic damping and the appearance of quasielastic central peaks which were observed upon approaching the phase transition temperature. The relaxation times derived from the acoustic mode anomalies and the central peak were consistent with each other and showed a slowing-down behavior. These precursor phenomena were attributed to the polar clusters having broken inversion symmetry. The substitution of Hf with Sn induced a very soft intermediate phase between the paraelectric and the antiferroelectric phases, where the longitudinal acoustic mode exhibited the lowest mode frequency along with substantially high acoustic damping. The transverse acoustic mode, which was observed in the two antiferroelectric phases, did not appear in the intermediate phase. These

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