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High-Temperature Solution Growth and Characterization of (1-x)PbTiO₃-xBi $(Zn_{2/3}Nb_{1/3})O_3$ Piezo-/ferroelectric Single Crystals

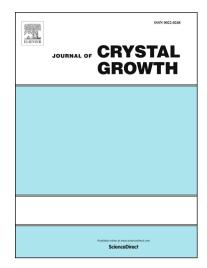
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High-Temperature Solution Growth and Characterization of (1-x)PbTiO₃-xBi(Zn_{2/3}Nb_{1/3})O₃ Piezo-/ferroelectric Single Crystals

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Abstract

Complex perovskite PbTiO₃-Bi(Me'Me'')O₃ solid solutions represent new materials systems that possess a higher Curie temperature ($T_{\rm C}$) than the relaxor-PbTiO₃ solid solutions, useful for potential applications. To this end, novel ferroelectric single crystals of the (1-x)PbTiO₃-xBi($Z_{\rm N}$ 2/3Nb_{1/3})O₃ (PT-BZN) solid solution were successfully grown by the high-temperature solution growth (HTSG) method. Powder X-ray diffraction shows that the symmetry of the grown crystals is tetragonal. The dielectric permittivity and optical domain structures were characterized by dielectric measurements and polarized light microscopy, respectively, as a function of temperature, revealing a first-order ferroelectric-paraelectric phase transition at a $T_{\rm C}$ of 436 ± 2 °C. Based on the $T_{\rm C}$, the average composition of the crystal platelet was estimated to be 0.58PT-0.42BZN. Piezoresponse force microscopy measurements of the phase and amplitude

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