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High-Temperature Solution Growth and Characterization of  $(1-x)\text{PbTiO}_3$ - $x\text{Bi}(\text{Zn}_{2/3}\text{Nb}_{1/3})\text{O}_3$  Piezo-/ferroelectric Single Crystals

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# High-Temperature Solution Growth and Characterization of (1-x)PbTiO<sub>3</sub>-xBi(Zn<sub>2/3</sub>Nb<sub>1/3</sub>)O<sub>3</sub> Piezo-/ferroelectric Single Crystals

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## Abstract

Complex perovskite PbTiO<sub>3</sub>-Bi(*Me'**Me''*)O<sub>3</sub> solid solutions represent new materials systems that possess a higher Curie temperature ( $T_C$ ) than the relaxor-PbTiO<sub>3</sub> solid solutions, useful for potential applications. To this end, novel ferroelectric single crystals of the (1-x)PbTiO<sub>3</sub>-xBi(Zn<sub>2/3</sub>Nb<sub>1/3</sub>)O<sub>3</sub> (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  $T_C$  of  $436 \pm 2$  °C. Based on the  $T_C$ , 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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