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# Enhanced piezoelectric and ferroelectric properties of BiFeO<sub>3</sub>-BaTiO<sub>3</sub> lead-free ceramics by optimizing the sintering temperature and dwell time

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## Abstract

0.7BiFeO<sub>3</sub>-0.3BaTiO<sub>3</sub> (BFO-0.3BT) ceramics were prepared to uncover the impacts of sintering temperature ( $T_s$ ) and dwell time ( $t_d$ ) on the microstructure and electrical properties. With increasing the  $T_s$  or  $t_d$ , the grain sizes increase along with the porosity decreases, which is in favor of the alignment of dipole. However, excess  $T_s$  or  $t_d$  are inclined to cause the volatilization of Bi<sub>2</sub>O<sub>3</sub>, which deteriorates piezoelectric properties. Because of the  $R$ - $T$  two-phase coexistence, low defect ions concentration and porosity, as well as appropriate grain size, the excellent  $d_{33}$ =208 pC/N and  $k_p$ =35.46% as well as  $P_r$ =28.52 $\mu$ C/cm<sup>2</sup> were achieved in BFO-0.3BT ceramics at  $T_s$ =1000 °C and  $t_d$ =6h. In addition, large unipolar strain 0.13% and  $d_{33}^*$ =256.2 pm/V also were obtained in BFO-0.3BT ceramics at  $T_s$ =1000 °C and  $t_d$ =6h. This research indicates that the porosity and defect ion concentration as well as grain size also play an important role in piezoelectric properties in BFO-BT ceramics.

**Keywords:** Bismuth ferrite, Piezoelectricity, Morphotropic phase boundary, lead-free piezoceramics.

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