

Dielectric and piezoelectric properties of lead-free $(\text{Na}_{0.5}\text{K}_{0.5})\text{NbO}_3\text{-Ba}(\text{Ti}, \text{Sn})\text{O}_3$ ceramics

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Abstract : Lead-free piezoelectric ceramics $0.97(\text{Na}_{0.5}\text{K}_{0.5})\text{NbO}_3\text{-}0.03\text{Ba}(\text{Ti}_{1-x}\text{Sn}_x)\text{O}_3$ [NKN-BTS-x] ceramics doped with 1 mol% MnO_2 have been fabricated by a sintering technique with muffling. The MnO_2 -doped NKN-BTS-x ceramics with $x \leq 0.2$ have pure orthorhombic perovskite structure at room temperature. The dense microstructure was developed with grain growth as an increase of amount of Sn. Moreover, the addition of Sn was found to have a significant influence on piezoelectric properties.

In particular, the MnO_2 -doped NKN-BTS-0.1 ceramics showed improved piezoelectric properties of piezoelectric constant ($d_{33}=145\text{pC/N}$), relatively large electromechanical coupling factor ($k_p=43\%$), dielectric constant ($\epsilon_{33}^T/\epsilon_0=676$) dielectric loss ($\tan \delta =1.3\%$)