

**Structural and piezoelectric properties of
lead-free (1-x)(Na_{0.5} K_{0.5})NbO₃-xBa(Ti_{0.9}, Sn_{0.1})O₃ ceramics**

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Lead-free (1-x)(Na_{0.5}K_{0.5})NbO₃ - xBa(Ti_{0.9}Sn_{0.1})O₃ [NKN-BTS-100x] ceramics doped with 1 mol% MnO₂ have been prepared by the conventional solid state method and their structural and piezoelectric properties were investigated. The NKN-BTS-100x ceramics exhibited a dense and homogeneous microstructure when they were sintered at 1030-1150°C. Grain growth was observed for the specimen sintered at relatively low temperature of 1050°C. A tetragonal/orthorhombic morphotropic phase boundary (MPB) in the perovskite structure was also appeared for the NKN-BTS-100x ceramics (0.04 < x < 0.07) sintered at 1050°C. The enhanced piezoelectric properties in the NKN-BTS ceramics with a MPB composition were obtained. Especially, for the NKN-BTS-6 ceramics, a high dielectric constant ($\epsilon^T_{33}/\epsilon_0=1,400$), piezoelectric constant ($d_{33}=237$) and electromechanical coupling factor ($k_p=0.42$) were obtained.

Keywords: Lead-free piezoelectric ceramics, morphotropic phase boundary (MPB), lead free relaxors

비납계 (1-x)(Bi_{0.5}K_{0.5})TiO₃-xBiFeO₃ 세라믹의 유전 및 압전 특성

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Dielectric and piezoelectric properties of Lead-free (1-x)(Bi_{0.5}K_{0.5})TiO₃-xBiFeO₃ ceramics prepared by a conventional solid state reaction method were investigated in the range of x = 0~10 mol%. Piezoelectric coefficient was increased from 31 pC/N at x = 0 mol% to 64 pC/N at x = 6 mol% then decreased with increasing x. Electromechanical coupling factor (K_p) was increased up to 0.18 at x = 10 mol%. On the other hand, mechanical quality factor (Q_m) was decreased. Grain size was not much changed with various x and a single perovskite with tetragonal symmetry was maintained at all compositions forming a solid solution between (Bi_{0.5}K_{0.5})TiO₃ and BiFeO₃. Depolarization temperature (T_d) was gradually decreased with increasing x from 302 °C at x = 0 to 245 °C at x = 10 mol%.

Keywords: Lead-free, Bismuth potassium titanate, Bismuth ferrite