Properties and Structures of Nonstoichiometric (K,Na)NbO_3-based Lead-free Ceramics

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The $0.968[(K_{0.48}Na_{0.52})]Nb_{0.95+x}Sb_{0.05}O_3$-$0.032(Bi_{0.5}Na_{0.5})ZrO_3$ [KNN_xS-BNZ] lead-free ceramics with nonstoichiometric niobium ion were fabricated via conventional solid-state sintering technique and their piezoelectric, dielectric and ferroelectric properties were investigated. When x= 0.010, enhanced piezoelectric properties (d_{33} ≈ 421 pC/N and k_p ≈ 0.47) were obtained due to construction of rhombohendral – tetragonal phase boundary near room temperature. The KNN_xS-BNZ ceramics possesses enhanced Curie temperature with improved piezoelectric constant. A large d_{33} of ~ 421 pC/N and a high T_c ~ 256 ℃ can be simultaneously induced in the ceramics with x= 0.010.