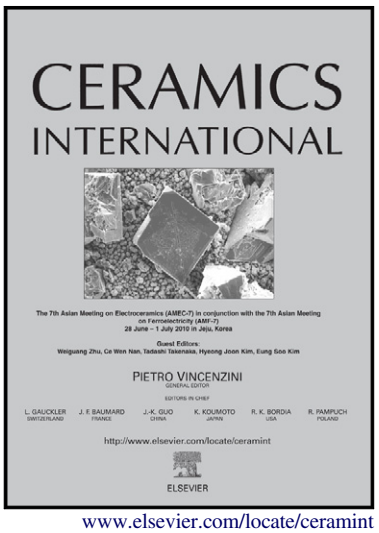

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Defect dipoles -driven ferroelectric behavior in potassium sodium niobate ceramics

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Abstract $K_{0.48}Na_{0.52}NbO_3$-0.05 mol%Re_2O_3 (Re=La, Nd, and Yb) ceramics were prepared by a conventional solid-state sintering method, and defect dipoles -induced ferroelectric behaviors have been investigated. All ceramics show an orthorhombic phase at room temperature. The tolerance factor, X-ray diffraction and Raman spectra analysis show that La^{3+} and Nd^{3+} predominantly dissolve in (K, Na) sites and induces the unit cell shrinkage, while Yb^{3+} occupies both (K, Na) and Nb cationic sites and causes the unit cell expansion, respectively. Due to defect dipoles polarization, P_D^A and P_D^{AB}, KNN-Re_2O_3 ceramics display different ferroelectric properties. Ferroelectric order of KNN-Yb_2O_3 ceramics were stabilized by P_D^{AB}, so their ferroelectric properties (P_r~32.7 μC/cm^2, E_c~7.6 kV/cm) and thermal stability were improved. A constricted hysteresis loop in KNN-Yb_2O_3 ceramic at a high measurement temperature is formed because of the domain pinning from Nb^{5+}, K^+ and Na^+ ions.

Keywords: KNN ceramics; Rare earth oxides; Defect dipoles; Ferroelectric properties;

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