

# Structural and Electrical Properties of Lead-Free $(K_{0.5}Na_{0.5})NbO_3$ - $xLiTaO_3$ Ceramics Synthesized by Hydrothermal Method

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## Abstract:

Nowadays, due to environmental concerns, there is a need for finding the suitable alternative of lead based ferroelectric materials. Lead free ferroelectric materials with perovskite structure have attracted much attention since they are easy to prepare and the structure is simple compared to other structures. Among all the lead-free ferroelectric systems  $(K_{0.5}Na_{0.5})NbO_3$  (KNN) based materials have attracted lots of attention because of their superior piezoelectric properties, high Curie temperature ( $T_c$ ) and environmental friendly nature. But, there is a major problem lies in the KNN system i.e difficulty in obtaining high density by conventional solid state reaction route (CSSRR). Modification of KNN system can help in obtaining high density by CSSRR. Therefore, in this paper we have studied the modified KNN system i.e  $(K_{0.5}Na_{0.5})NbO_3$ - $xLiTaO_3$  (KNN-LT).

Lead-free  $(1-x)(K_{0.5}Na_{0.5})NbO_3$ - $xLiTaO_3$  (KNN-LT) a morphotropic phase boundary (MPB) composition, ferroelectric ceramics were synthesized by hydrothermal method. The paper mainly focused on the relationship among the microstructure, the phase transition, and the electrical properties of KNN-xLT ceramics synthesized by hydrothermal method. The morphotropic phase boundary (MPB) between orthorhombic and tetragonal phases appears around  $x=6$  mol% LT at room temperature. Similar to  $Pb(Zr, Ti)O_3$ , the piezoelectric and the electromechanical properties are enhanced for the composition near the morphotropic phase boundary.

**Keywords:** Perovskites; Dielectric properties; Ferroelectric Properties; Sintering

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