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Influence of yttrium dopant on the structure and electrical conductivity of potassium sodium niobate thin films

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Abstract

KNN thin films with diverse yttrium concentration (mol % = 0, 0.1, 0.3, 0.5, 0.7 and 0.9) were fabricated using sol-gel spin coating technique. Doped KNN revealed that Y^{3+} was successfully doped into the ABO_3 perovskite lattice without changing the phase formation of KNN. The thickness of the deposited layer of KNN produced with increasing dopant concentration was determined to be 200 nm with dense and well-defined grains. Afterwards, the vibrational bonding and conductivity of KNN films with diverse yttrium concentration were identified according to the charge compensation mechanism. At high dopant concentration of > 0.5 mol %, O-Nb-O bonding was asymmetric and became distorted due to B-site occupancy by yttrium dopant. Further investigation revealed that charge compensation mechanism was shifted by increasing doping concentration. As a result, yttrium-doped KNN became semi-conductive at low yttrium concentration. Meanwhile, at high concentration, yttrium-doped KNN became an insulator and underwent ionic compensation.

Author keywords

Conductivity; Doped; KNN; Structural; Thin film; Yttrium

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