

Preparation of potassium tantalate niobate thin films by chemical solution deposition and their characterization

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Potassium tantalum niobate ($\text{KTa}_x\text{Nb}_{1-x}\text{O}_3$, (KTN), where $x = 0, 0.21, 0.36, 0.53, 0.74, 0.82, 0.86$, and 1) thin films of perovskite structure were prepared by chemical solution deposition on Si and SiO_2 glass substrates. A homogeneous and stable precursor solution was obtained by dissolving potassium, niobium and tantalum isobutoxides in absolute isobutanol and an addition of diethanolamine as a modifier. Optimum conditions for film preparation were found. Annealing temperature and heating regime, Al_2O_3 “chemical” buffer layer and KNbO_3 seeding layer were the determining factors for film quality. It was demonstrated by X-ray diffraction that the films have desired pseudocubic perovskite structure. Infrared transmittance was measured for broad range of Ta/Nb ratios. The spectra show continuous transformation from KTaO_3 to KNbO_3 and indicate that the optical axis lies in the plane of the film.