

Highly Accelerated Lifetime Testing of Potassium Sodium Niobate Thin Films

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Highly accelerated lifetime tests of 2 and 3 μm thick potassium sodium niobate $[(\text{K}_{0.5}, \text{Na}_{0.5})\text{NbO}_3, \text{KNN}]$ films with different thicknesses were measured under electric fields ranging from 160 to 350 kV/cm and temperatures ranging from 90 to 210 degrees C. The medium time to failure ($t(50)$) was determined from a lognormal distribution plot of failure times of up to 22 electrodes per measurement condition. The activation energy (E_a) for failure was 0.7460.04 eV and 0.92 ± 0.05 eV for the 2 μm and 3 μm KNN films, respectively. The voltage acceleration factor was 3.5 ± 0.34 for the 3 μm film. But the electric field dependence of $t(50)$ for the 2 μm film showed two regions with similar N , 6.67 and 6.94 ± 0.23 , respectively. Energy-dispersive X-ray spectroscopy was employed to investigate the Na^+ and K^+ ion distributions in KNN films. Published by AIP Publishing.