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Systematic investigation of electrical and optical properties of $Sr_{1-x}Ba_xNb_2O_6$ films

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ABSTRACT BODY:

Optical switching and modulation remains a major technological challenge in many photonic applications, with optical switching relying on electric field induced changes of the refractive index (Pockels effect). Bulk $Sr_{1-x}Ba_xNb_2O_6$ (SBN) shows a particularly large Pockels coefficient ($r_{33} \approx$ 1400 pm/V for x = 0.25, i.e. 30 times larger than that of the most commonly used material, $LiNbO_3$). Here we present results on thin SBN films obtained via a pulsed-laser high-throughput deposition method, in which the composition of the deposited material varies laterally across a substrate plate. Physical properties obtained at different positions on the substrate can then be correlated to the chemical composition of the material. In particular, we use a 2-modulator generalized ellipsometer to determine the refractive index in the range λ = 300 - 800 nm, and scanning microwave microscopy to determine the dielectric constant at f = 1.6 GHz. A variable-temperature stage on the latter system allows us to observe changes related to the ferroelectric transition of SBN. Results provide insight as to which regions in the composition space may be appropriate for specific applications.

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