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Modulating the ratio of tetragonal/rhombohedral phases in strained $BiFeO_3$ films by varying the oxygen pressure during deposition[1]

MARGO STARUCH, HEUNGSOO KIM, Naval Research Laboratory — Room-temperature multiferroic $BiFeO_3$ (BFO) has been the subject of recent research interest due to its potential applications in random access memory and other spintronic devices. Compressive strain in the BFO lattice results in a symmetry change from a rhombohedral to a monoclinically-distorted tetragonal structure, with intermediate strains lying near a morphotropic phase boundary. This has been demonstrated to lead to enhanced piezoelectric and dielectric properties. However, the effect of growth conditions, such as substrate temperature and oxygen partial pressure during deposition, on the multiferroic properties of strained BFO films has yet to be systematically studied. In this work, $BiFeO_3$ thin films were grown on (001) $LaAlO_3$ single crystal substrates by pulsed laser deposition at different oxygen partial pressures. By examining the structure and microstructure of the resulting films, the ratio of the tetragonal-like and rhombohedral phases was found to vary with oxygen deposition pressure. The effects of this modulation on the magnetic and ferroelectric properties will be presented.

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Margo Staruch
Naval Research Laboratory

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