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Strain-dependence of the structure and ferroic properties of epitaxial NiTiO3 thin films grown on different substrates T. VARGA, T.C. DROUBAY, M.E. BOWDEN, S.A. STEPHENS, Pacific Northwest National Laboratory, S. MANANDHAR, EMSL, Pacific Northwest National Laboratory, V. SHUTTHANANDAN, R.J. COLBY, B.C. KABIUS, E. APRA, S.A. CHAMBERS, Pacific Northwest National Laboratory — Polarization-induced weak ferromagnetism has been predicted a few years back in perovskite $MTiO_3$ (M=Fe,Mn,Ni). We set out to stabilize this metastable perovskite structure by growing $NiTiO_3$ epitaxially on different substrates, and to control the polar and magnetic properties via strain. Epitaxial $Ni_{1-x}Ti_{1-y}O_3$ films of different Ni/Ti ratios and thicknesses were deposited on Al_2O_3, Fe_2O_3/Al_2O_3, and $LiNbO_3$ substrates by pulsed laser deposition at different temperatures, and characterized using several techniques. The effect of substrate choice, film thickness, deposition temperature, and film stoichiometry on lattice strain, film structure, and physical properties was investigated. Our structural data from x-ray diffraction, electron microscopy, and x-ray absorption spectroscopy shows that substrate-exerted strain has a marked effect on the structure and crystalline quality of the films. Physical property measurements reveal a dependence of the Néel transition, the weak ferromagnetism, and lattice polarization on strain, and suggest that the choice of substrate and film stoichiometry can be used to control the ferroic properties in $NiTiO_3$ thin films. Our results are also consistent with the theory prediction that the ferromagnetism in acentric $NiTiO_3$ is polarization-induced.

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