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Systematic investigation of the growth, structure, and ferroic properties of strained epitaxial $Ni_{1-x}Ti_{1-y}O_3$ thin films with multiferroic potential T. VARGA, T.C. DROUBAY, M.E. BOWDEN, S.A. STEPHENS, S. MANANDHAR, V. SHUTTHANANDAN, R.J. COLBY, B.C. KABIUS, E. APRA, S.A. CHAMBERS, Pacific Northwest National Laboratory — Ferroelectrically 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 in an attempt to achieve the multiferroic properties in these compounds. Epitaxial $Ni_{1-x}Ti_{1-y}O_3$ films of different 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, suggest that the predicted perovskite structure was made. Our physical property characterization showing lattice polarization, ferromagnetism, and a likely coupling between the ferroic order parameters indicate that *R3c* $NiTiO_3$ with potential multiferroic properties has been synthesized. Lattice strain from mismatch has a marked effect on the structure of the films. Film stoichiometry and the choice of substrate were found to affect the observed ferroic properties. These results suggest that the properties of the films can be controlled by the choice of substrate and film stoichiometry.

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