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Structure and Electronic Transport in $BaSnO_3$ Deposited *via* High Pressure Oxygen Sputtering KOUSTAV GANGULY, PALAK AMBWANI, JONG SEOK JEONG, K. ANDRE MKHOYAN, PENG XU, CHRIS LEIGHTON, BHARAT JALAN, University of Minnesota — We present structural and electronic transport properties of oxygen vacancy-doped $BaSnO_3$ films grown on $SrTiO_3$(001) and MgO(001) using the high pressure oxygen sputtering technique. High-resolution x-ray diffraction (HRXRD), combined with scanning transmission electron microscopy (STEM), confirms phase-pure epitaxial $BaSnO_3$(001) films on both substrates. The out-of-plane lattice parameter obtained from wide-angle x-ray diffraction is used as a sensitive probe for cation stoichiometry and strain relaxation. Irrespective of growth parameters, the out of plane lattice parameter remains unchanged, close to that of bulk (4.116 Å). A detailed thickness-dependent structural study using HRXRD and STEM suggests the formation of misfit dislocations as the primary mechanism for strain relaxation. We further show that as-grown, insulating $BaSnO_3$ films can be made conductive with n-type carriers (with typical room temperature concentrations and Hall mobilities being 10^{19} cm^{-3} and 12 $cm^2V^{-1}s^{-1}$) via high temperature (900 °C) vacuum annealing. Analysis of transport data from films with fixed density indicates a significant influence of film thickness, and thus strain relaxation, on the electron mobility. Temperature-dependent transport and magnetotransport studies will be described in detail as a function of annealing conditions, and will be correlated to strain relaxation. This work is supported by NSF through the UMN MRSEC.

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