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Comparison of the Structural, Magnetic and Piezoelectric Properties of $BiFeO_3$ and $BiCrO_3$ Thin Films CHRISTIANNE BEEKMAN, WOLTER SIEMONS, T.Z. WARD, NINA BALKE, PETRO MAKSYMOVYCH, Oak Ridge National Laboratory, CHRISTIAN SCHLEPUETZ, Argonne National Laboratory, NANCY SENABULYA, YONGSOO YANG, ROY CLARKE, University of Michigan, HANS CHRISTEN, Oak Ridge National Laboratory — Multiferroic $BiCrO_3$ is a perovskite-structured oxide that is antiferroelectric and antiferromagnetic at low temperature [1,2] and is structurally very similar to the better studied $BiFeO_3$. Here we present a comparative study of the structural, magnetic and piezoelectric properties of $BiFeO_3$ and $BiCrO_3$ thin films. Highly strained $BiFeO_3$ films grown on $LaAlO_3$ substrates adopt the nearly tetragonal T' polymorph (c/a $\sim$ 1.25), however, they are rarely structurally uniform, instead tilted T' and tilted S'-polymorphs (c/a $\sim$ 1.09) coexist in the form of stripe patterns [3,4]. More importantly we find that the presence of S' is a prerequisite for ferroelectric switching [4,5]. Here, we extend this work to $BiCrO_3$ films grown on various substrates. Synchrotron and neutron measurements allow us to carefully characterize both the structural and magnetic properties of $BiCrO_3$ thin films. This research was supported in part by the U.S. DOE-BES, Materials Sciences and Engineering Division, and performed in part at the CNMS, ShaRE, and APS DOE-BES user facilities. [1] F. Sugawara et al., J. Phys. Soc. Jpn. **25**, 1553 (1968) [2] D.H. Kim et al., Appl. Phys. Lett. **89**, 162904 (2006) [3] R.J. Zeches et al., Science **326**, (2009) [4] C. Beekman et al., Adv. Mater (in press) [5] W. Siemons et al., J Phys. D (in press)

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