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Systematic investigation of multiferroic properties of $(Bi_{1-x}Sm_x)FeO_3$ and $(Bi_{1-x}La_x)FeO_3$ thin films using composition spreads MAKOTO MURAKAMI, University of Maryland, V. NAGARAJAN, University of New South Wales, A. VARTHARAJAN, University of New South Wales, S. FUJINO, University of Maryland, M. WUTTIG, University of Maryland, I. TAKEUCHI, University of Maryland — $BiFeO_3$ and its room temperature multiferroic properties have attracted much attention. However, it is generally believed that its magnetic and ferroelectric properties have not been unambiguously established. There have been some reports of A-site substituted $BiFeO_3$ aimed at improving its properties. In this study, we report on synthesis and multiferroic properties of La and Sm modified $BiFeO_3$ thin films. In particular, in order to systematically study these systems, we fabricated composition spread thin films of $(Bi_{1-x}Sm_x)FeO_3$ and $(Bi_{1-x}La_x)FeO_3$ (x=0∼1) on $SrTiO_3$ and $LaAlO_3$ substrates using combinatorial pulsed laser deposition. Several structural transitions were found in the middle of the spreads in both systems using x-ray microdiffraction. In $(Bi_{1-x}La_x)FeO_3$, the structure was found to change from rhombohedral to paramagnetic phase at about 20% of $BiFeO_3$. Ferroelectric properties and magnetic properties of the spreads were mapped using piezoforce microscopy and scanning SQUID microscopy. We report on the effect of the structural transitions on their multiferroic properties. This work was supported by NSF MRSEC DMR 0520471 and ONR.

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