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Systematic investigation of rare-earth doped BiFeO₃ thin films using composition spreads S. FUJINO(1), V. NAGARAJAN(2), M. MURAKAMI(1), S.-H. LIM(1), A. VARTHARAJAN(2), L. SALAMANCA-RIBA(1), M. WUTTIG(1), I. TAKEUCHI(1)(3) — (1) Department of Materials Science and Engineering, University of Maryland, USA (2) University of New South Wales, AU (3) Center for Superconductivity Research, University of Maryland, We have systematically investigated compositionally varied rare-earth (RE) doped BiFeO₃ thin films using the combinatorial approach. Epitaxially grown (Bi_{1-x}RE_x)FeO₃ composition spread thin films were fabricated by laser molecular beam epitaxy on SrTiO₃ (001) substrates with an SrRuO₃ buffer layer. Transmission electron microscopy of the films showed that homogeneous epitaxial films were obtained throughout the composition range. Structural properties of (Bi_{1-x}RE_x)FeO₃ was mapped using scanning x-ray diffraction, and structural transitions were observed at various compositions. In some compositions, substantial enhancement in ferroelectric properties was observed at the structural transition: increase in the dielectric constant, increase in the piezoelectric response, and decrease in the coercive field were observed, while high polarization is maintained. Detailed dependence of various properties on composition variation will be discussed. Work supported by NSF DMR 0094265, DMR 0231291, MRSEC DMR-00-0520471 and the W. M. Keck Foundation.

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