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Structural and electrical properties of self-assembled $(BiFeO_3)_{0.5}$:$(Sm_2O_3)_{0.5}$ nanocomposite films HAO YANG, Superconductivity Technology Center, Los Alamos National Laboratory, H. WANG, Department of Electrical and Computer Engineering, Texas A&M University, J.L. MACMANUS-DRISCOLL, Department of Materials Science and Metallurgy, University of Cambridge, Q.X. JIA, Superconductivity Technology Center, Los Alamos National Laboratory — Self-assembled $(BiFeO_3)_{0.5}$:$(Sm_2O_3)_{0.5}$ nanocomposite films were deposited on (001) $SrTiO_3$ and Nb-doped $SrTiO_3$ substrates by pulsed laser deposition using a single uniformly mixed target. Analysis from both high-resolution X-ray diffraction and transmission electron microscopy revealed self-assembled epitaxial two-phase $BiFeO_3$ (BFO) and Sm_2O_3 (SmO) composites in nanoscale. The BFO and SmO domains have grown alternately and vertically aligned with average column size of 10 nm. The dielectric properties of BFO:SmO nanocomposite films were investigated and compared with those of pure BFO and SmO thin films. The dielectric constant of the nanocomposites can be well described by a parallel connection of two individual dielectrics of BFO and SmO. On the other hand, the dielectric loss of nanocomposite films is lower than the theoretical value from such a parallel connection model. This might originate from the reduction of leakage current density of BFO phase in nanocomposite film due to the much larger interfacial area and the strong out-of-plane strain of each BFO column.

Hao Yang
Superconductivity Technology Center, Los Alamos National Laboratory

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