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The Nanostructure Formation and Growth Evolution of Ferroelectric/Ferromagnetic $BiFeO_3$-$CoFe_2O_4$ Thin Films[1] SHENG YU YOUNG, LOURDES G. SALAMANCA-RIBA, Materials Science and Engineering Department, University of Maryland, College Park, HAIMEI ZHENG, Materials Science and Engineering Department, University of California Berkeley — We have investigated the mechanism of the self-assembly of $BiFeO_3$-$CoFe_2O_4$ (BFO-CFO) ferroelectric/ferromagnetic thin film nanostructures using high-resolution transmission electron microscopy. We discuss the formation of the CFO columnar structure during the deposition process. The BFO-CFO thin films were deposited on $SrTiO_3$ (001) single crystal substrates using pulsed laser deposition at a substrate temperature of 700 ^{o}C and deposition rate of around 5nm/min. In the early stages of growth, CFO domains form with dome like island shape and are covered by a BFO layer. After approximately 10 mins of continuous deposition, the nanocomposite rearranges and diffusion dominates to form a self-assembly of faceted CFO columns that extend to the surface of the film. These columns show pyramidal-like faceted shape and are embedded in the BFO matrix. A few atomic layers of BFO lie at the interface between the CFO columnar structures and the substrate. This layer helps relax the misfit strain between CFO and STO. The magnetic properties of the nanocomposite samples will also be presented.

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