The effect of oxygen annealing on structure, magnetism and surface morphology of compressive strained $BaFe_{0.9}Ti_{0.1}O_{3-\delta}$ thin films

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Abstract: We explore the influence of oxygen annealing on $BaFe_{0.9}Ti_{0.1}O_{3-\delta}$ (BFTO) thin films fabricated on $SrTiO_3$ (001) (STO) single crystal substrates. The structural studies (X-Ray diffraction and Reciprocal Space Maps) reveal a structural change from tetragonal, in as grown BFTO thin films, to orthorhombic phase in oxygen annealed BFTO thin films. The surface morphology studied using Atomic Force Microscope reveal an increase in grain size and surface roughness of oxygen annealed thin films as compared to that of as-grown BFTO thin films. The magnetization isotherm at 300K show a remarkable increase in coercivity indicating the appearance of hard magnetic phase while the magnetization at 10K is found to increase by multiple folds in oxygen annealed BFTO thin films. Our results demonstrate that though in our earlier studies Ti-doping is found to cause structural and magnetic disorder in $BaFeO_{3-\delta}$ thin films but on annealing in oxygen the BFTO system shows a dramatic change in structure, surface morphology and magnetism.

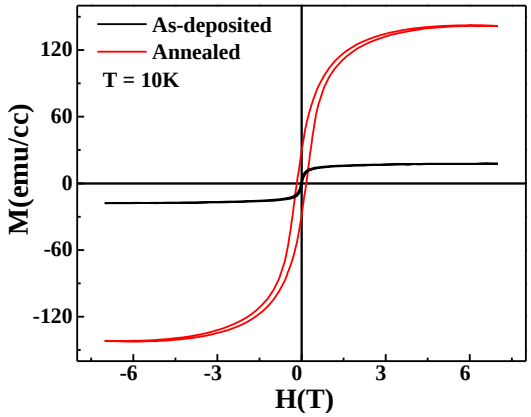

Figure 1: Magnetization isotherms of As-deposited and oxygen annealed $BaFe_{0.9}Ti_{0.1}O_{3-\delta}$ thin film at 10K.