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Strain-controlled easy axis orientation of epitaxial $CoFe_2O_4$ films by He implantation ANDREAS HERKLOTZ, ANTONY T. WONG, Oak Ridge National Laboratory, STEFANIA F. RUS, National Institute for Research and Development in Electrochemistry and Condensed Matter, THOMAS Z. WARD, Oak Ridge National Laboratory — Heteroepitaxial strain engineering is an essential tool in the strongly correlated systems for investigating fundamental coupling effects and for more practical control of thin film properties. Here, we use strain doping by He implantation as an alternative technique to control thin film functionalities. We demonstrate the tuning of the magnetic anisotropy of $CoFe_2O_4$ (CFO) films through He implantation. Compressively strained thin films of CFO are grown coherently on MgO substrates and show pronounced out-of-plane magnetic anisotropy. Successive doping of the CFO films with He using a commercial ion gun results in an expansion of the out-of-plane lattice parameter while maintaining in-plane epitaxial lock to the substrate. We observe a continuous rotation of the magnetic easy axis towards the film plane with increasing unit cell tetragonality. The results are in agreement with the strain-induced change of the magnetic anisotropy due to the large negative magnetostriction of CFO and demonstrate that strain doping via He implantation is an elegant path to tune desired characteristics of transition metal oxide thin films. This work was supported by the U. S. Department of Energy, Office of Science, Basic Energy Sciences, Materials Science and Engineering Division.

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