Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Study of strain-modulated effects on $CoFe_2O_4$ epitaxial films YI-CHUN CHEN, YI-DE LIOU, KUN-HONG WU, Department of Physics, National Cheng Kung University, CHIH-KUO WANG, YING-HAO CHU, Department of Material Science and Engineering, National Chiao Tung University — Due to the improvement of thin film growth technique, epitaxial films directly grown on flexible substrates became possible recently. These kinds of flexible systems not only have the advantage of easy integration for device applications, but also provide a template to purify strain effects for physical mechanism study. Here, we investigate the evolution of the spinel $CoFe_2O_4$ (CFO) epitaxial film on a muscovite substrate with variable curvatures. CFO possesses superior magnetic properties with high Curie temperature and large magnetostrictive anisotropy. The CFO film on muscovite is (111) oriented, corresponding to a magnetic hard-axis along the out-of-plane direction. Under the in-plane asymmetric strain, based on the frequency shift of Raman A1g phonon, the unit cell volume of CFO increases with the tensile strain while decreases with the compressive strain. The tunable volume ratio is about 0.7%. The A1g and T2g phonon evolutions also show the Co/Fe cation migration temperature decreases both under tensile and compressive strain with the degradation up to 40 K. Moreover, when out-of-plane magnetic field is applied, the magnetostriction constant increases with the compressive strain, which implies the tunable orientation of magnetic easy axis in this flexible system.

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Date submitted: 10 Nov 2016 Electronic form version 1.4