Field-dependent Magnetic Anisotropy of Single Crystal Fe$_{1-x}$Ga$_x$ Films on ZnSe(100)$^1$ HONGYAN LI, ADAM MCCLURE, IAN VRABLE, GALINA MALOVICHKO, YVES IDZERDA, Physics department, Montana State University — Magnetoelectric alloys in the thin film form that are pinned to a substrate are of current interest as materials for controlled spin dynamic damping. When the single crystal magnetoelectric alloy material Fe$_{1-x}$Ga$_x$ (which has a large magnetostriction value in the bulk) is epitaxially deposited onto the non-magnetoelectric material ZnSe, a biaxial strain is generated at the interface because of lattice mismatch. Anisotropic mechanical strain relaxation will generate a uniaxial magnetic anisotropy in the thin film. The application of a magnetic field will modify the strain resulting in an additional field dependent uniaxial contribution. This has been demonstrated using multi-frequency, angle-dependent ferromagnetic resonance measurements on single crystal Fe$_{1-x}$Ga$_x$ thin films, ranging from 0% to 60% Ga concentration, deposited on ZnSe(001) surfaces that display a field independent cubic anisotropy while the uniaxial anisotropy is dependent on the applied field.

$^1$Army Research Office Grant #W911NF-08-1-0325.