Exchange Bias in Fe$_x$Ni$_{1-x}$F$_2$/Co Bilayers

MIYEON CHEON, ZHONGYUAN LIU, DAVID LEDERMAN, Multifunctional Materials Laboratory, Dept of Physics, West Virginia University — FeF$_2$ is an ideal antiferromagnet with a tetragonal rutile crystal structure and a strong uniaxial magnetic anisotropy along the c-axis ([001] direction). NiF$_2$ also shares the rutile crystal structure with similar lattice parameters, but its magnetic anisotropy causes spins to be in the a−b plane, resulting in a weak ferromagnetism due to a small tilting of the antiferromagnetic sublattices. Because several theories predict that exchange bias should be a strong function of the magnetic anisotropy in the antiferromagnet, the Fe$_x$Ni$_{1-x}$F$_2$/Co bilayer system provides a framework whereby this can be studied experimentally. We have grown several single-crystalline Fe$_x$Ni$_{1-x}$F$_2$50 nm thick films on MgF$_2$ (110) substrates via molecular beam epitaxy with $x$ varying between 0 and 1.0. We will report on the exchange bias as a function of Fe concentration in the alloy.

$^1$Supported by NSF grant DMR-0400578.