Parallel Versus Antiparallel Interfacial Coupling In Exchange-biased Co/FeF_2

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The nature of exchange bias in FeF_2(110) remains elusive due to it's nominally compensated surface. Other interesting phenomena include positive exchange bias [1] and an enhancement of the the coercivity near T_2 [2]. In order to address these issues, soft x-ray dichroism absorption spectroscopy was used to investigate the direction of interfacial exchange coupling in a antiferromagnetic/ferromagnetic exchange-coupled Co (2.5 nm) /FeF_2 (68 nm) bilayer. Because of its excellent surface and interface sensitivity this technique is excellently suited to unambiguously address the size and the orientation of the magnetic moment at the interface of such a structure [3,4].

The FeF_2 was epitaxially grown on MgF_2 (110) and the Co layer was polycrystalline. The sample was capped with a 2.0 nm layer of Pd to protect it from oxidation. For comparison, a nominally identical sample without Co was also grown. A small portion of interfacial Fe spins couples antiparallel to the ferromagnet, causing the positive exchange bias for cooling fields. A larger potion of interfacial spins, coupled more strongly and parallel to the ferromagnet, increases the degree of antiferromagnetic order and plays an important role in the observed coercivity increase at high temperatures [5].

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