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Interplay between Exchange Bias and Uniaxial Anisotropy[1] S.-H. CHUNG, A. HOFFMANN, M. GRIMSDITCH, Materials Science Division, Argonne National Laboratory — The effect of the relative orientation and magnitudes of the exchange bias and the uniaxial shape anisotropy has been systematically investigated in nanometer sized strips of NiFe/FeMn bilayers. The magnetic behavior of these patterned lines was characterized using magneto-optic Kerr effect for different orientations of the applied magnetic field. The samples exhibit peculiar magnetic behavior when the exchange bias, the uniaxial anisotropy, and the applied magnetic field are not collinear. In the case when the exchange bias and the uniaxial anisotropy are parallel, the shift of the hysteresis loop changes non-monotonically with the orientation of the applied magnetic field and exhibits a maximum loop shift that exceeds the value that would be expected from the interface coupling alone. Furthermore, when the applied magnetic field is perpendicular to the exchange bias, the magnitude and the orientation of the uniaxial anisotropy determines the magnitude and the sign of the loop shift. A simple modified coherent rotation model provides a quantitative prediction of the hysteretic behavior in these patterned exchange bias systems. These results show clearly that, in order to understand interfacial coupling, in addition to the loop shift, it is also necessary to characterize all other magnetic anisotropies.

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