Abstract Submitted
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Exchange Biased Vortices[1] J. SORT, J. NOGUÉS, M.D. BARÓ, Universitat Autònoma de Barcelona, Spain, S.-H. CHUNG, K. BUCHANAN, M. GRIMSDITCH, V. NOVOSAD, A. HOFFMANN, Argonne National Laboratory (MSD and CNM), B. DIENY, SPINTEC, Grenoble, France — Soft ferromagnetic discs with submicrometer diameter can reverse their magnetization via nucleation and annihilation of a vortex state. We prepared 400 nm diameter discs of $Ni_{80}Fe_{20}$/IrMn bilayers, where the exchange coupling between the ferromagnetic $Ni_{80}Fe_{20}$ and the antiferromagnetic IrMn modifies the magnetization reversal. Annealing of the $Ni_{80}Fe_{20}$/IrMn discs in an applied field establishes an exchange bias along the direction of the magnetic field during annealing. Magneto-optic Kerr effect measurements with the field applied along the exchange bias direction reveal a typical vortex hysteresis loop, which is now shifted with respect to zero field. Magnetic force microscopy in applied fields confirm that the reversal is via a vortex state. When the applied field is rotated with respect to the exchange bias direction the nucleation and annihilation fields reduce slightly, until at a critical angle of $\approx 80^\circ$, beyond which no vortex nucleation is observed. Micromagnetic simulations show that beyond the critical angle the magnetization reversal occurs via rotation of a C-state.

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