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Atomic Spin Dynamics during reversal in composite media SONALI MUKHERJEE, Seagate Research, LUC BERGER, Carnegie Mellon University — We present spin dynamics during reversal for composite material (exchange coupled hard and soft phases). Up until now, consensus has been that reversal is by coherent rotation with the field determined by the average of the intrinsic reversal fields of the two pure phases. Atomic scale simulations show non-coherent reversal. Reversal is initiated in the soft phase and a domain wall is formed at the interface between the hard and soft phase which propagates through the hard phase under the action of the field. The two important fields associated with the reversal process are Hk1 (reversal field for soft phase) and Hdw (domain wall propagation field from soft to hard phase). The switching field is determined by max(Hk1,Hdw). Hdw is found to be 1) proportional to anisotropy difference of the two phases and 2) inversely proportional to the total moment of the two phases. In the limit of zero anisotropy difference between the phases Hdw becomes negligible as expected. Hk1 on the other hand depends on the geometrical length of the soft phase. The lowest limit of Hk1 is equal to the intrinsic reversal field of the soft phase when its length (L1) is sufficient to support the intrinsic domain wall width (Ldw). When $L1 < Ldw$, Hk1 increases in proportion to the excess energy required to accomodate the domain wall in the soft phase. Analytical expressions for both Hk1 and Hdw will be given and shown to agree very well with our simulations and experiments in Appl. Phys. Lett. 82, 2859 (2003).

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