Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Finite temperature modeling of magnetization processes in exchange-coupled films R. H. KODAMA, Univ. of Illinois at Chicago, A. E. BERKOWITZ, Univ. of California, San Diego — Recent experimental studies by Berkowitz, et al. [PRB **72**, 134428 (2005)] have explored the effect of setting the exchange anisotropy of ferromagnetic / antiferromagnetic bilayers (FM/AFM) such as Co / (Ni,Co)O by deposition in a magnetic field at temperatures well below the T_N or blocking temperature of the AFM material. Two remarkable effects inspired this theoretical study: (1) the magnitude and direction of unidirectional anisotropy is modified by changing the applied magnetic field during deposition of the FM overlayer, and (2) there is a "latent period" after deposition is complete, during which the unidirectional anisotropy is modified by changing the field. We set out to determine if these effects could be understood using orthodox models of exchange anisotropy (invoking uncompensated interfacial moments on an ensemble of AFM grains) carried to an unprecedented level of detail. Finite interactions between FM-FM, AFM-AFM, and FM-AFM grains allow modeling of domain processes in both FM and AFM films. Finite temperature is included in a novel way, using a detailed analysis of the spin system's energy surface to determine sets of activation barriers and final states for low-energy collective modes. Results indicate that some of the observed effects can indeed be simulated in this way, although some of the experimental results are more consistent with a slow, interfacial redox reaction that changes the magnetic state of the interface.

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Date submitted: 07 Dec 2005 Electronic form version 1.4