Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Magnetic properties of coupled Gd/Pd/Ni thin films ILIR ZOTO, GARY MANKEY, MINT Center, Department of Physics, University of Alabama — Transition metal-rare earth bilayers might allow magnetizations higher than that available from transition metal if the strong exchange interactions of the transition metal layer could be used to raise the Curie temperature of an adjacent, high moment rare earth layer. Literature suggested for a ferromagnetic interaction in the Ni-Gd bulk alloys and an increased moment at room temperature when Gd layer is deposited onto thin Co and permalloy films. Recently, we found that Ni/Gd bilayers couple antiferromagnetically at the interface. Adding a spacer layer could change the coupling behaviour. Here, a study of a Gd(15nm)/Pd(tnm)/Ni(10nm) trilayer is presented with t varying from 0.5 to 2.5nm. The hysteresis loops were measured with VSM in the temperature range 5-250K. A Stoner-Wolfarth model simulates the hysteresis loops through the minimization of the energy of the following expression:

$$E = -M_1 H t_1 \cos(\theta_1) - M_2 H t_2 \cos(\theta_2) + K_1 t_1 \sin^2(\theta_1) + K_2 t_2 \sin^2(\theta_2)$$
$$+ J_1 \cos(\theta_1 - \theta_2) + J_2 \cos^2(\theta_1 - \theta_2)$$

where J_1 and J_2 are the bilinear and biquadratic coupling constants. The simulated loops are in good agreement with the experimental results and confirm the antiferromagnetic coupling of Ni and Gd layers for t<2.5nm and the disappearance of the coupling for t>2.5nm.

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Date submitted: 04 Dec 2005 Electronic form version 1.4