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Exchange Bias in Ferromagnetic/Antiferromagnetic/Ferromagnetic Co/FeF_2/Co Trilayers[1]

TRENT JOHNSON, DAVID LEDERMAN, West Virginia University, LEDERMAN GROUP TEAM — We have measured the magnetic properties of Co(20 nm)/FeF_2(2 nm)/Co(5 nm) trilayers grown on Al_2O_3 substrates via e-beam evaporation. The layers were polycrystalline and the samples were capped with 5 nm of Pd to avoid oxidation. The sample surface was very smooth, as indicated by AFM images where the underlying substrate's atomic terraces were visible, while the interface roughness parameters were on the order of 1 nm determined from x-ray reflectivity. After field-cooling to below the Néel temperature of FeF_2 in either 1 kOe and 5 kOe, magnetic hysteresis loops were measured as a function of temperature. We found that both layers have a negative exchange bias, with the exchange bias of the thinner layer larger than that of the thicker layer. In addition, the coercivity below the blocking temperature T_B of the thinner layer was significantly larger than that of the thick layer, even though the coercivity of the two layers is the same for $T > T_B$. The drastic difference in coercivities for $T < T_B$ illustrates the importance of the interface magnetic order on the reversal mechanism of the ferromagnet.

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Trent Johnson
West Virginia University

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