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Magnetization reversal and magnetic imprinting in a giant exchange bias system M.R. FITZSIMMONS, LANL, J.A. BORCHERS, NIST, M. LAVER, PSI, K.L. KRYCKA, W.C. CHEN, S. WATSON, NIST, C. DUFOUR, K. DUMESNIL, Laboratoire de Physique des Matériaux, Université H. Poincaré Nancy — We present compelling experimental evidence, obtained with small angle neutron scattering (SANS) that magnetization reversal of an exchange biased $DyFe_2/YFe_2$ superlattice occurs via reversal of magnetic domains with at least two different length scales. Our SANS studies used both unpolarized neutron beams (with a high field magnet) and polarized neutron beams using ^{3}He filter polarization analysis. Magnetic length scales ranging from tens of nanometers to greater than several hundreds of nanometers were observed. The magnetization contained within nanometer large domains constituted a significant fraction of the total magnetization at the exchange bias field. During magnetization reversal some of the domains were arranged in a quasi-periodic manner. Because the ferromagnetic domains are so small, they exchange couple to relatively small portions of the pinned magnetic layer (i.e., $DyFe_2$), which at the nm length scale may appear relatively perfect. This reasoning may explain why the $DyFe_2/YFe_2$ system is a system that exhibits among the largest exchange bias observed to date. This work was supported by the Office of Basic Energy Science, U.S. Department of Energy and the National Science Foundation. ML acknowledges support from DanScatt.

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