Characterization of Bit Patterned Media (BPM) with Composite Structures

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Interest in patterned magnetic structures is driven by interesting physics and the potential of nanomagnetism-based materials in new applications from high density magnetic data storage, through magnetic logic to biomagnetic functionality. BPM is a leading candidate to increase magnetic recording densities. Besides, it provides unique opportunities for implementing complex heterostructures, like exchange-coupled composites, to achieve new functionalities. We will discuss recent experiments on [Co/Pd] multilayers and [Co/Pd]/Fe/[Co/Pd] heterostructures patterned in nano-dot arrays using self-assembled diblock copolymer as the etch mask. These structures were designed to reduce the coercive fields and switching field distributions (SFD) due to Fe soft coupling layer inside Co/Pd multilayers. These structures are also candidate material system for microwave assisted magnetic recording as the Fe layer resonant frequency is significantly lower than that of the Co/Pd layers. Time dependent switching characteristics were analyzed at various magnetization points along the hysteresis loop to analyze the distribution of the energy barriers. We find strong variations in the measured energy barrier vary by an order of magnitude during reversal which can be quantitatively understood from the dipolar interactions of islands.