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Long-time scale study of thermally activated grain reversal in dual-layer Exchange Coupled Composite recording media.

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The dynamic response of magnetic media on long time scales is governed by the thermally activated reversal of uniformly magnetized nano-meter grains. Such processes are controlled by 'rare events.' Accurately modelling rare event presents a challenge as conventional micromagnetic techniques are limited to time scales on the order of micro-seconds. One approach that can be applied to simulate such rare-event processes is the Kinetic Monte Carlo method (KMC) [1]. The KMC method computes the time between successive grain reversals induced by an external magnetic field based on an Arrhenius-Neel approximation for thermally activated processes. The method has recently been applied to successfully model single-grain media and shows good agreement with both micromagnetics [2] and experimental MH-loops [3]. More recently we have extended the algorithm to study dual-layer Exchange Coupled Composition (ECC) media used in current generations of disc drives. The generalization of the KMC method to ECC media is complicated by the complex reversal process of coupled grains. We present recent results for ECC media reversal calculated using the KMC method where the energy barrier separating the metastable states is obtained from the minimum energy path (MEP) using a variant of the nudged elastic band method [4] and the attempt frequency is calculated based on the Langer formalism [5]. This extends previous work on weakly coupled ECC media [6].

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