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Energy landscape for switching in spin-valve nanopillars with perpendicular magnetic anisotropy[1] DANIEL B. GOPMAN, Physics Department of New York University, DANIEL BEDAU, JORDAN KATINE, San Jose Research Center, Hitachi-GST, ERIC E. FULLERTON, CMRR, University of California, San Diego, STEPHANE MANGIN, Institut Jean Lamour, UMR CNRS 7198, Nancy Universite, A.D. KENT, Physics Department of New York University — Recent experiments have established that thermally activated switching in perpendicularly magnetized spin-valve (SV) nanopillars larger than about 40 nm in diameter is dominated by sub-volume nucleation and domain wall propagation. Despite this complex behavior, room temperature measurements of the switching field distributions indicate thermal activation over a single energy barrier [1]. To better understand the magnetization reversal process, we conducted temperature dependent studies of the switching statistics in nanopillars in which we stabilize non-uniform magnetization states formed by a sub-volume nucleation event. We present results on Co—Ni free layers in SV nanopillars, which include a perpendicularly magnetized fixed layer. Here we measure the distribution of switching events as a function of temperature from 20 K to 300 K. The temperature dependence of both nucleation and propagation distributions is consistent with a thermal activation model, with distinct field-dependent barrier heights for each stage in the reversal process. This is evidence of an energy landscape for switching, which should be relevant for understanding the switching of SV devices even at temperatures that no longer show metastable non-uniform states. [1] Appl. Phys. Lett. 100, 062404 (2012)

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