Effect of Asymmetric Leads on Switching Currents in Magnetic Nanopillars

JACK BASS, HUSEYIN KURT, WILLIAM PRATT JR., Physics Department and Center for Sensor Materials, Michigan State University, East Lansing, MI 48824, ALBERT FERT, Unite Mixte de Physics, CNRS/THALES, Orsay, France 91404 — Manschot et al.[1] predicted that the critical current for switching from parallel (P) to antiparallel (AP) magnetic states in ferromagnetic/nonmagnetic/ferromagnetic (F/N/F) nanopillars could be reduced by as much as an order of magnitude via asymmetric nonmagnetic leads with different effective resistances (resistivity times spin diffusion length). They proposed sandwiching the nanopillar between high effective resistance Cu (next to the free layer) and low effective resistance Pt (next to the fixed layer). Combining Pt with Ag$_{0.95}$Sn$_{0.05}$ (which has a higher effective resistance than Cu), we found a much more modest reduction in switching current between average data for AgSn/Co/Cu/Co/Pt and Pt/Co/Cu/Co/AgSn nanopillars. We'll compare our relative switching currents with calculations using a diffusive transport model based upon the Valet-Fert theory of current-perpendicular-to-plane magnetoresistance. [1] Jan Manschot et. al. Appl. Phys. Lett. 85, 3250 (2004).

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