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Spin Transfer Switching and Magnetization Dynamics in Py/Cu/Py Nanopillar Spin-Valves with Sidewall Oxide Passivation and Nonuniform Current Injection OZHAN OZATAY, KEE WEE TAN, PRAVEEN GOWTHAM, PATRICK M. BRAGANCA, ERIC MICHAEL RYAN, GREGORY D. FUCHS, JOHN C. READ, ANDRE K. MKHOYAN, MALCOLM G. THOMAS, KIRAN V. THADANI, JACK C. SANKEY, JOHN SILCOX, DANIEL C. RALPH, ROBERT A. BUHRMAN, Cornell University — The manipulation of magnetization, both to drive precessional dynamics and trigger magnetization reversal in nanomagnets by transferring spin angular momentum from a spin-polarized current, presents opportunities for better scalability in nanoscale magnetic memory devices and microwave oscillators. Some of the major practical concerns include reducing the current level needed to write magnetic bits in an error-free fashion at high operating speeds in memory devices as well as exciting highly coherent dynamic modes for nanoscale microwave oscillator applications. In this work we report on the detrimental effects of the adventitious antiferromagnetic oxides at the perimeter of Py/Cu/Py nanomagnets such as an anomalous increase in magnetic damping at low temperatures and stochastic fluctuations in switching fields. We find that in addition to sidewall oxide passivation, the concentrated spin torque from nonuniform injection also reduces the sidewall effects leading to a more efficient spin transfer switching mechanism as well as microwave dynamics.

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