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Enhanced Magnetic Damping in Spin-Transfer Excitation E. M. RYAN, P. M. BRAGANCA, J. C. READ, N. C. EMLEY, G. D. FUCHS, J. C. SANKEY, D. C. RALPH, R. A. BUHRMAN, Cornell University — While magnetic damping is understood to play a fundamental role in spin-torque phenomena, little experimental work has been done to study the effect of varying the damping parameter α. Recently, light terbium (Tb) doping in thin films of permalloy (Py) has been shown to increase α by several orders of magnitude [1]. To directly study the effect of increased α on spin-transfer systems, we have fabricated 0.008 um^2 Py/Cu/Py nanopillar spin valves with Tb-doping between 0 and 2% in the free layer. We find that the critical currents for reversibly switching the free layer (proportional to α) are several times larger on average in the 2% Tb samples than in pure Py samples. This substantial increase is still considerably less than the increase in α observed in the bulk film measurements of similar composition samples, suggesting that processes other than intrinsic spin-orbital coupling can dominate α in spin-transfer nanopillars, in agreement with simulation and pulsed measurements [2]. We compare this effect across a range of temperatures, and also discuss how the Tb doping affects the processional dynamics. These results suggest one approach for controllably reducing the negative impact of spin torque effects on nanoscale spin valve and tunnel junction read head sensors. [1] W. Bailey, P. Kabos, F. Mancoff, and S. E. Russek, IEEE Trans. Magn. 37, 1749 (2001). [2] P. M. Braganca, et al. Appl. Phys. Lett. 87, 112507 (2005).

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