Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Spin-transfer-induced magnetization reversal in bilayer nanopillars as a function of free layer thickness[1] W. CHEN, A.D. KENT, Department of Physics, NYU, M.J. ROOKS, J.Z. SUN, IBM Research Center — Bilayer magnetic nanopillars have been studied as a function of free layer thickness at low temperature to test models of spin-transfer induced switching and the factors that control the critical current for reversal. In particular, the critical current for magnetization reversal in large magnetic fields applied perpendicular to the junction surface at 4.2 K has been measured. Samples with lateral dimensions smaller than 100 nm were fabricated using a nano-stencil mask process that produces large arrays of junctions. This has been combined with a thin film in-situ wedge growth mechanism that enables continuous variation of free layer thickness between 0 and 4 nm across the wafer. The final stack consists of a 12 nm fixed Co layer, 10 nm of Cu, followed by the thin free Co layer of variable thickness. The resistance and differential resistance of junctions were measured as a function of magnetic field (0 to 6 T) and current density. A clear switching boundary is observed and the critical current for reversal increases linearly with magnetic field for H$>$ 1.5 T, even for junctions with free layer thicknesses well below 1 nm. The slope dI_c/dH has only a weak dependence on free layer thickness, in contrast to the linear dependence expected in the original model of spin-transfer. We discuss possible origins for this behavior. We also present magnetotransport and FMR studies of ultra-thin Co films ($<$ 5 nm), which shed light on their magnetic characteristics.

[1]Supported by NSF-DMR-0405620 and ONR N0014-02-1-0995

Andrew Kent
New York University

Date submitted: 02 Dec 2004 Electronic form version 1.4