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Electrical Pulse Modification and Reversal of the Exchange-Bias in Magnetic Tunnel Junction Structures YUN LI, HSIN-WEI TSENG, DAN RALPH, ROBERT BUHRMAN, CORNELL UNIVERSITY TEAM — The use of antiferromagnetic layers to exchange-bias (EB) the reference layer is common in spin-torque (ST) experiments. Previous work has shown that the EB in both MTJs and spin valves can be degraded or reversed by electrical pulses, with the effect being attributed to heating or possibly to ST effects in the spin valve case. We have studied EB modification due to individual electrical pulses in the presence of a small external field (<50Oe) in FeCoB/MgO/FeCoB/IrMn MTJs as a function of MgO thickness. For MgO thickness = 1.7 nm, RA = 5 x $10^3\Omega\mu m^2$, pulses with J_c = 4 x $10^4 A/cm^2$ and V =1.8 V, can repeatedly and reliably reverse the EB. For 1.3 nm barriers, RA =150$\Omega\mu m^2$**,** much higher power pulses, J_c = 6 x $10^5 A/cm^2$ and V =0.9 V, are required for reversal. Such results indicate that a combination of heating and ST, with the latter possibly involving the field-like spin torque component at high bias, is responsible for EB reversal in our MTJs. We will discuss the details of the EB reversal behavior and report the phase diagram for reversal as function of electrical and field bias.

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