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Origin of perpendicular magnetic anisotropy in Co/Ni multilayers on Ti layer SEE-HUN YANG, IBM Almaden Research Center, KUEI-HUNG THOMS, Industrial Technology Research Institute, LUC THOMAS, STUART PARKIN, IBM Almaden Research Center — Magnetic materials in which their magnetic moment direction is oriented perpendicular to the plane of the magnetic layers in thin film heterostructures have been much studied for their potential application to spintronic devices. In particular, theories of current induced excitation, via the phenomenon of spin torque transfer, show that perpendicularly magnetized layers can be more easily excited or their magnetization direction switched than in-plane magnetized layers. In particular, Co/Ni multilayers are promising due to high spin polarization and small Gilbert damping compared to Co/Pt or Fe/Pt. However, their perpendicular magnetic anisotropy (PMA) is highly sensitive to the underlayer that is critical in device performance because, for instance, the current shunting can substantially reduce the spin transfer torque in magnetic racetrack memory. We observed an excellent PMA in annealed Co/Ni on Ti underlayer whose resistance is significantly greater than those of Co/Ni, thereby minimizing the current shunting. It is found that the PMA does not simply originate from magneto-crystalline effect (spin-orbit interaction) but mainly from magnetoelastic effect caused by compressive strain along (111) direction. We will present systematic results and quantitative analyses.

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