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Large electric-field control of perpendicular magnetic anisotropy in strained [Co/Ni] / PZT heterostructures DANIEL GOPMAN, CINDI DENNIS, P. J. CHEN, NIST - Natl Inst of Stds Tech, YURY IUNIN, Institute of Solid State Physics, Russian Academy of Sciences, Chernogolovka, Moscow Region, Russia, ROBERT SHULL, NIST - Natl Inst of Stds Tech — We present a piezoelectric/ferromagnetic heterostructure with PMA - a Co/Ni multilayer sputtered directly onto a $Pb(Zr,Ti)O_3$ (PZT) substrate. Chemical-mechanical polishing was used to reduce the roughness of PZT plates to below 2 nm *rms*, enabling optimal magnetoelectric coupling via the direct interface between PZT and sputtered Co/Ni films with large PMA (K_{eff} = (95 9 kJ/m^3)). We grew the following layer stack: Ta(3)/Pt(2)/[Co(0.15)/Ni(0.6)]$_{x4}$/Co(0.15)/Pt(2)/Ta(3); numbers in parentheses indicate thicknesses in nm. Applied electric fields up to +/- 2 MV/m to the PZT generated 0.05% in-plane compression in the Co/Ni multilayer, enabling a large electric-field reduction of the PMA (ΔK_{eff} $\geq 10^3$ J/m^3) and of the coercive field (35%). Our results demonstrate that: (i) heterostructures combining PZT and [Co/Ni] exhibit larger PMA (K_{eff} ~10^5 J/m^3) than previous magnetoelectric heterostructures based on Co/Pt and CoFeB, enabling thermally stable hybrid magnetoelectric/spintronic devices only tens of nm in diameter and (ii) electric-field control of the PMA is promising for more energy efficient switching of spintronic devices.

Daniel Gopman
NIST - Natl Inst of Stds
Tech

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