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Cap-Induced Magnetic Anisotropy in Ultra-thin Fe/MgO(001) Films[1] TOBIAS BROWN-HEFT, Materials Department, University of California Santa Barbara, MIHIR PENDHARKAR, Electrical and Computer Engineering Department, University of California Santa Barbara, ELIZABETH LEE, Engineering Department, Harvey Mudd College, Claremont, CA, CHRIS PALMSTROM, Electrical and Computer Engineering Department Materials Department, University of California Santa Barbara — Magnetic anisotropy plays an important role in the design of spintronic devices. Perpendicular magnetic anisotropy (PMA) is preferred for magnetic tunnel junctions because the resulting energy barrier between magnetization states can be very high and this allows enhanced device scalability suitable for magnetic random access memory applications. Interface induced anisotropy is often used to control magnetic easy axes. For example, the Fe/MgO(001) system has been predicted to exhibit PMA in the ultrathin Fe limit. We have used *in-situ* magneto optic Kerr effect and *ex-situ* SQUID to study the changes in anisotropy constants between bare Fe/MgO(001) films and those capped with MgO, Pt, and Ta. In some cases in-plane anisotropy terms reverse sign after capping. We also observe transitions from superparamagnetic to ferromagnetic behavior induced by capping layers. Perpendicular anisotropy is observed for Pt/Fe/MgO(001) films after annealing to 300C. These effects are characterized and incorporated into a magnetic simulation that accurately reproduces the behavior of the films.

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