Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Magnetic anisotropy modulation of magnetite in $Fe_3O_4/BaTiO_3(100)$ epitaxial structures CARLOS A.F. VAZ, JASON HOFFMAN, AGHAM POSADAS, CHARLES AHN, Yale University and Center for Research on Interface Structures and Phenomena (CRISP) — Temperature dependent magnetometry and transport measurements on epitaxial Fe3O4 films grown on $BaTiO_3$(100) single crystals by molecular beam epitaxy show a series of discontinuities that are attributed to changes in the magnetic anisotropy induced by strain in the different crystal phases of $BaTiO_3$. High resolution x-ray diffraction measurements show that the magnetite film is under tensile strain at room temperature, which is ascribed to the lattice expansion of $BaTiO_3$ at the cubic to tetragonal transition, indicating that the magnetite film is relaxed at the growth temperature. From the magnetization versus temperature curves, the variation in the magnetic anisotropy is determined and compared with numerical estimates for the magnetoelastic anisotropies. In particular, the tensile strain in the Fe_3O_4 films is shown to give rise to a strong perpendicular magnetic anisotropy, as observed experimentally. These results demonstrate the possibility of using the piezoelectric response of $BaTiO_3$ to modulate the magnetic anisotropy of magnetite films.

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Date submitted: 02 Dec 2008 Electronic form version 1.4