Abstract Submitted
for the MAR05 Meeting of
The American Physical Society

Magnetic circular dichroism (MCD) measurements of cobalt-doped titanium dioxide films[1] J.R. SIMPSON, H.D. DREW, S.R. SHINDE, S.B. OGALE, T. VENKATESAN, Materials Research Science and Engineering Center, Univ. of Maryland, College Park — Cobalt-doped TiO_2 has generated interest as a dilute magnetic oxide displaying room-temperature ferromagnetism with $T_c \geq 650\,\mathrm{K}$ for low-doped materials. However, controversy surrounding the mechanism for such a high T_c and the observation of Co clusters cast doubts on this system as an intrinsic ferromagnetic oxide. A recent study[2] reporting the importance of growth conditions on Co solubility confirms the existence of ferromagnetism in films showing no direct evidence of clustering. MCD offers promise as a technique to characterize the intrinsic nature of magnetism and probe the band structure. A sensitive heterodyne technique using a photoelastic modulator measures MCD in the visible frequency range at magnetic fields up to 1.5 T. We report a comparison of MCD measurements on thin films of well-oxygenated anatase $Ti_{1-x}Co_xO_{2-\delta}$ ($x \leq 0.07$) exhibiting no clustering with those on clustered films. Additionally, we compare MCD results to optical absorption measurements,[3] which reveal a shift of the band edge upon cobalt doping and an absence of mid gap cobalt impurity states.

[1]This work supported in part by NSF-MRSEC Grant No. DMR-00-80008 and DARPA Grant No. SpinS N000140210962.
[2]S. R. Shinde *et al.*, Phys. Rev. B **67**, 115211 (2003).
[3]J. R. Simpson *et al.*, Phys. Rev. B **69**, 193205 (2004).

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Date submitted: 03 Jan 2005 Electronic form version 1.4