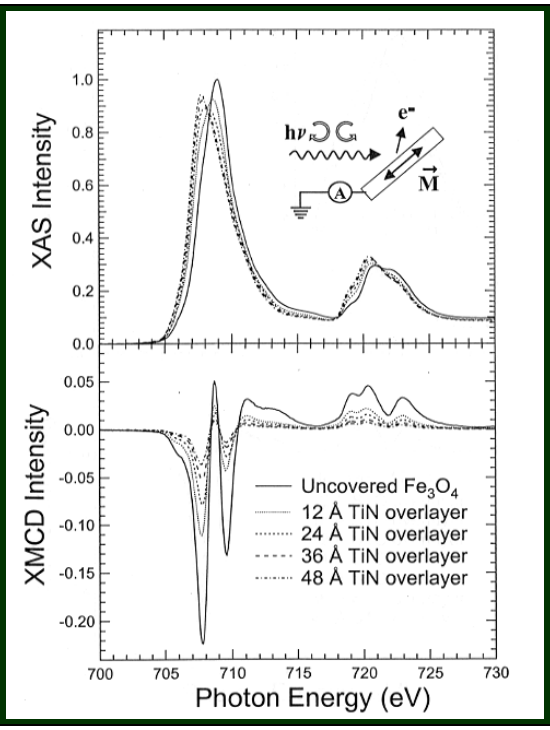
Characterization of $SrTiO_3/Fe_3O_4$ and TiN/Fe_3O_4 interfaces

A. Lussier, Y.U.Idzerda (Montana State), S. Stadler (Sourthern Illinois)
S. B. Ogale, S. R. Shinde, and T. Venkatesan (UMD)

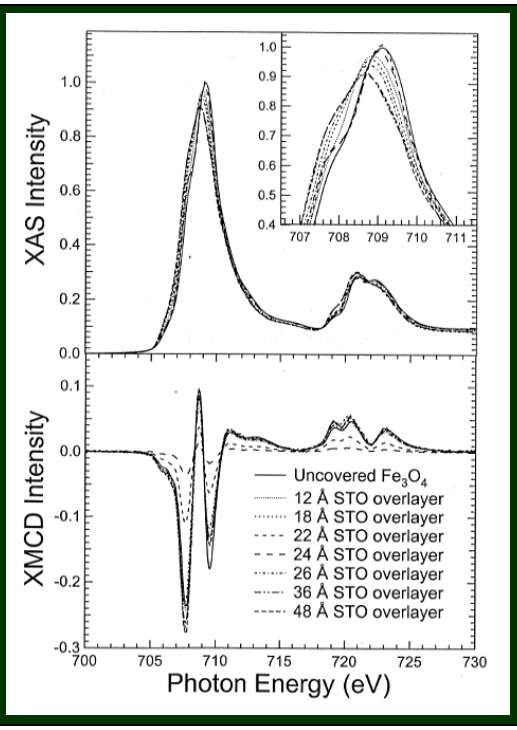
Realization of a true Magnetic interface is critical for SPINTRONICS

Fe_3O_4, with a projected 100% spin polarization, is considered useful in spintronics. We have examined therefore the interface formation between $SrTiO_3$ or TiN with a 2000 Å thick Fe_3O_4 film by X-ray absorption spectroscopy and X-ray Magnetic Circular Dichroism.

Deposition of 10-50 Å of TiN results in immediate and substantial removal of oxygen from the near interface region, leading to the formation of spin randomizing FeO interlayers. On the other hand, for $SrTiO_3$ case, only a small deviation from XAS signatures of Fe_3O_4 is seen, suggesting a limited, perhaps a monolayer worth, formation of another oxide phase at the interface. The persistent Fe_3O_4 XMCD signal confirms the preservation of Fe_3O_4 in its ferromagnetic state. Thus, $SrTiO_3$ may be a good barrier layer for potential Fe_3O_4 based spintronics heterostructures.



The peak area normalized $FeL_{2,3}$ **XAS** (top) and **XMCD** (bottom) spectra as a function of TiN overlayer thickness. The upper inset is the experimental geometry. The XMCD intensity is corrected for incidence angle and incomplete degree of circular polarization of the beam.



The peak area normalized $FeL_{2,3}$ **XAS** (top) and **XMCD** (bottom) spectra as a function of $SrTiO_3$ overlayer thickness. Upper inset is the enlargement of the L_3 peak. The XMCD intensity is corrected for incidence angle and incomplete degree of circular polarization of the beam.