Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Magnetism of Fe nanostructure on ultrathin $BaTiO_3$ film X. CHEN, University of Nebraska-Lincoln, J. KIM, S. YANG, J.S KIM, G. ROJAS, R. SKOMSKI, M. BODE, A. BHATTACHARYA, T. SANTOS, N. GUISINGER, H. LU, A. GRUVERMAN, C. BINEK, V. SESSI, J. HONOLKA, A. ENDERS — A study of Fe nanostructure on $BaTiO_3$ (BTO) thin films with variable temperature scanning tunneling microscopy (STM) and X-Ray Magnetic Circular Dichroism (XMCD) under ultrahigh vacuum is presented. Fe/BTO is a prototype system for the study of magneto-electric effects but it is experimentally challenging to achieve high quality metal-oxide interfaces. Our approach is to use atomically flat, unreconstructed and stoichiometric BTO films of 13 unit cell thickness on $SrTO_3$, and to deposit Fe impurity atoms and small clusters with molecular beam epitaxy at T = 8 K and compact nanometer clusters by buffer layer assisted growth for comparison. The magnetism of both systems was studied by XMCD at the Fe L3/2 absorption edges. The key observation is that even isolated Fe atoms on the BTO have a sizeable magnetic moment, which quickly increases with increasing coverage. This, together with a detailed analysis of the L 3/2 line shape, is evidence that intermixing and oxidation at the Fe/BTO interface is strongly suppressed. The interface quality achieved can thus potentially be exploited to experimentally observe a magneto-electric interface effect predicted by Tsymbal et al. [Phys. Rev. Lett. 97, 047201 (2006)].

Xumin Chen
University of Nebraska-Lincoln

Date submitted: 20 Jan 2011 Electronic form version 1.4