Abstract Submitted
for the MAR09 Meeting of
The American Physical Society

Interface structure determination of crystalline oxides on silicon using synchrotron x-ray diffraction F.J. WALKER, J.W. REINER, A.M. KOLPAK, Y. SEGAL, Yale University, Z. ZHANG, Argonne National Laboratory, D. SU, Y. ZHU, Brookhaven National Laboratory, M.S. SAWICKI, C.C. BROADBRIDGE, Southern Connecticut State University, S. ISMAIL-BEIGI, C.H. AHN, Yale University — As electronic devices are reduced in size, well controlled atomically abrupt interfaces become increasingly important. This is especially true for field effect devices where the conducting channel is only a few atoms thick. Here we discuss the experimental determination of the atomic structure of an interface for a model system, crystalline oxides on silicon, which contains the essential elements of field effect devices. For both BaO/Si and $SrTiO_3$/Si structures, we use a combination of synchrotron x-ray scattering, Z-contrast transmission electron microscopy and density functional theory to determine the structure. The combination of these approaches has led to a unique detailed model of the interface. We have discovered features of these interfaces that emerge during growth that can be used to understand important elements of the measured electrical properties and microscopically identify sources of fixed charge, interface traps and field-dependent mobility.

Fred Walker
Yale University

Date submitted: 30 Nov 2008 Electronic form version 1.4