Abstract Submitted
for the MAR10 Meeting of
The American Physical Society

Interface transformations of $SrTiO_3$ during growth on Si (001) JAMES REINER, ALEXIE KOLPAK, FRED WALKER, SOHRAB ISMAIL-BEIGI, CHARLES AHN, Yale University, MONICA SAWICKI, CHRISTINE BROADBRIDGE, Southern Connecticut State University, DONG SU, YIMEI ZHU, Brookhaven National Laboratory — The integration of crystalline oxides and semiconductors has been made possible by the development of techniques that allow crystalline $SrTiO_3$ to be grown on the silicon (001) surface. This integration allows the wide range of behavior exhibited by crystalline oxides to be combined with the technological advantages silicon exhibits over single crystal complex oxide substrates. Recent studies have established, for specific growth conditions, the precise interface structure between a binary alkaline-earth oxide, BaO, and the silicon (001) surface. Due to the similarities in the crystal structure between $SrTiO_3$ and BaO, the $SrTiO_3$ interface with silicon (001) has been predicted to exhibit the same interfacial features, such as a 2×1 dimerized silicon surface and an initial alkaline-earth oxide atomic plane. However, we find that even though the MBE growth process of $SrTiO_3$ involves forming the alkaline earth interface structure initially, this interface transforms upon deposition of the TiO_2 layers. The resulting interface starts with a TiO_2 atomic plane and exhibits 1×1 symmetry without silicon dimers. We discuss the implications of this result for the growth of other complex oxides on silicon and for exploiting oxide functionality on a silicon platform.

James Reiner
Yale University

Date submitted: 20 Nov 2009 Electronic form version 1.4