

Abstract Submitted
for the MAR06 Meeting of
The American Physical Society

Coverage and bonding of thin, buried epitaxial SrTiO₃ on Si(100)

LENA FITTING, Applied and Engineering Physics, Cornell University, VENGOPALAN VAITHYANATHAN, Department of Material Science and Engineering, Pennsylvania State University, MELANIE JONES, Applied and Engineering Physics, Cornell University, DARRELL G. SCHLOM, Department of Material Science and Engineering, Pennsylvania State University, DAVID A. MULLER, Applied and Engineering Physics, Cornell University — SrTiO₃ can be used as a buffer layer for the growth of perovskite oxide heterostructures, opening up possibilities for the incorporation of novel materials into existing Si-based technology. While these layers have been studied during growth, a serious question for such thin layers is if their structure remains unaltered after they have been overgrown. Here, we present results of thin SrTiO₃ films grown on Si(100). Scanning transmission electron microscopy (STEM) of the buried structures shows the formation of islands and a non-uniform coverage of the first few monolayers after capping with a-Si. The island size increases if the SrTiO₃ film is grown on a SrSi_x seed. An important question that arises is the existence of oxygen vacancies at the interface between the oxide and the substrate. Oxygen deficiency leads to a doping of the empty Ti 3d band in bulk SrTiO₃ with electrons, thereby inducing a metallic phase as the Ti formal valence changes from 4+ to 3+. Using electron energy loss spectroscopy in a STEM the Ti valence across the interface is probed on the atomic scale.

Lena Fitting
Applied and Engineering Physics, Cornell University

Date submitted: 30 Nov 2005

Electronic form version 1.4