Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Nanoscale $BaTiO_3$ MOSCAP formation for ferroelectric field effect transistor application PATRICK PONATH, AGHAM POSADAS, Univ of Texas, Austin, MICHAEL SCHMIDT, PAUL HURLEY, RAY DUFFY, Tyndall National Institute, ALEX DEMKOV, Univ of Texas, Austin — Titanates are an important class of materials with many interesting functional properties and applications for non-volatile memory, i.e. $BaTiO_3$, which is a promising candidate for the realization of a ferroelectric field-effect transistor. However, the difficulty of chemically etching titanates has hindered their commercial use in device manufacturing so far. Here, we report a technique to circumvent this problem. Using molecular beam epitaxy, we grew compressively strained ferroelectric $BaTiO_3$, within photolithographically defined openings of a sacrificial SiO_2 layer on germanium (001) with Pt as a top electrode. Etching away the sacrificial SiO_2 can reveal isolated nanoscale gate stacks circumventing the need to etch the titanate thin film. Using X-ray diffraction we find that the $BaTiO_3$ film is tetragonal with the longer *c*-axis being out of plane, which is a requirement for the ferroelectric field effect transistor. The crystal quality of the $BaTiO_3$ films grown in the openings is confirmed using RHEED and cross-sectional transmission electron microscopy. Focused ion beam etching of the Pt layer is then used to electrically isolate a $Pt/BaTiO_3/SrTiO_3/Ge$ stack to perform electrical measurements.

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Date submitted: 06 Nov 2015 Electronic form version 1.4