Abstract Submitted
for the MAR13 Meeting of
The American Physical Society

Graphene Field Effect Sensors for the Study of Nanoscale Ferroelectric Thin Films ANIL RAJAPITAMAHUNI, VIJAY RAJ SINGH, ZHIYONG XIAO, XIA HONG, Department of Physics and Astronomy,University of Nebraska-Lincoln — We have constructed graphene field effect devices as sensors to study the dielectric and pyroelectric properties of nanoscale ferroelectric thin films. Using off−axis radio frequency magnetron sputtering, we have grown epitaxial single crystalline Pb(Zr,Ti)O_3(PZT) and (Ba,Sr)TiO_3 (BSTO) films of 30−100 nm thick on (001) Nb:$SrTiO_3$ substrates. X−Ray and AFM characterizations show the films have high crystallinity and smooth surface. Piezo-response force microscopy studies show that the as-grown PZT films have uniform polarization pointing towards the substrate. Graphene flakes are mechanically exfoliated on PZT and BSTO thin films and single to few layers are fabricated into field effect devices. We extract the carrier density in graphene from Hall Effect measurements, and use it to probe the polarization change of the ferroelectric gate layer. From the gating efficiency we found the dielectric constant of 100 nm PZT film to be 50. Its pyroelectric coefficient is $\sim$15 nC/cm^{2}K at 300 K and the polarization saturates below 100 K. We have also studied the effect of film thickness on the dielectric and pyroelectric properties of the ferroelectric thin films.

Anil Rajapitamahuni
Department of Physics and Astronomy,University of Nebraska-Lincoln

Date submitted: 09 Nov 2012 Electronic form version 1.4