Abstract Submitted
for the MAR08 Meeting of
The American Physical Society

UHV Growth of Graphene on SiC[1] PAUL CAMPBELL, GLENN JERNIGAN, KEITH PERKINS, BRENDA VANMIL[2], RACHEL MYERS-WARD[3], KURT GASKILL, JAMES CULBERTSON, JEREMY ROBINSON[4], ERIC SNOW, Naval Research Laboratory — We report graphene growth on Si- and C-face semi-insulating 6H SiC in UHV by thermal Si desorption /reconstruction of the remaining C. The SiC was etched in H_2 up to 1580 $^\circ$C to smooth the surface. XPS shows the H_2-etched surfaces are covered by an oxide which desorbs at 1000 $^\circ$C, resulting in a surface containing excess Si. At 1300 $^\circ$C, the surface becomes stoichiometric in Si and C and a $\sqrt{3}$ x $\sqrt{3}$ R30 LEED pattern is observed. At 1350 $^\circ$C, we observe a $6\sqrt{3}$ x $6\sqrt{3}$ R30 LEED pattern develop when graphene has formed, and a 1x1 LEED pattern for graphite films formed at temperatures greater than 1400 $^\circ$C. Graphene layers were grown under a variety of temperatures and conditions and characterized using XPS, LEED, AFM, Raman spectroscopy, and Hall effect. Top-gated FETs were fabricated with a wide range of gate lengths (1-25 microns) and gate widths (2-130 microns), and transistor operation was obtained for both single and multiple graphene layers.

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Date submitted: 26 Nov 2007 Electronic form version 1.4