Direct observation of a reconfigurable graphene p-n junction through surface potential imaging YUNFEI WANG, ZACHARY ROBINSON, JI UNG LEE, ROBERT E. GEER, State University of New York at Albany — Graphene p-n junctions have tremendous potential for future carbon-based electronic devices. Various theoretical models predict that graphene p-n junctions can be configured to guide electrons analogous to an optical wave guide or focus electrons as from a negative index lens, depending on abruptness of the electrostatic doping profile across the p-n junction. In this work, mechanically exfoliated graphene has been deposited on buried split-gate test structures to form pristine graphene p-n junctions not exposed to photoresist or lithographic patterning. An electrostatically formed p-n junction was created on this structure through the application of a voltage differential between the buried 'split' gates. Scanning Kelvin Probe Microscopy was used to directly and simultaneously image p-type, n-type and intrinsic regions on the monolayer graphene deposited across the p-n gate structure with nanometer spatial resolution and potential resolution in mV range. The electrostatic doping in graphene is seen to change according to gate polarity when varied from positive to negative values. This observation is reproducible for multiple samples studied. Graphene differential surface potential is measured as a function of split-gate electrode voltage and displays the expected square root behavior. Measurements of the junction profile are also presented and discussed.

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Date submitted: 20 Nov 2009   Electronic form version 1.4