Abstract Submitted
for the MAR11 Meeting of
The American Physical Society

Aligned, ultra-long graphene nanoribbon network fabrication by nanowire etch masks JOSHUA WOOD, SEAN SIVAPALAN, VINCENT DORGAN, CATHERINE MURPHY, ERIC POP, JOSEPH LYDING, University of Illinois at Urbana-Champaign — Patterning semi-metallic graphene into quasi one-dimensional structures known as nanoribbons (GNRs) can open a ∼0.5 eV bandgap by quantum confinement [1]. To circumvent GNR lithographic difficulties, Si nanowires (NWs) were used previously as an etch mask for exfoliated graphene [2], but with no scalability or alignment control. Conversely, we transfer ∼1 in^2 graphene sheets off copper to silicon dioxide, giving us a template for array fabrication. We meniscus align both Au NWs (<w>=20 nm, <l>=400 nm) and Ag NWs (<w>=200 nm, <l>=10 μm), respectively, on the graphene surface. By reactive ion etch (RIE), we remove the unmasked graphene, and we etch the NWs. Based on the starting NWs, the resulting GNR arrays have lengths ranging from 200 nm to tens of microns, and widths from 10 nm to 250 nm. We create single GNRs that can span micron-separated contacts and GNR networks, similar to a graphene nanomesh. Using atomic force microscopy and Raman spectroscopy, we determine that we have monolayer GNRs with a high disorder intensity I_D/I_G ∼1, indicating rough edges and graphene grain boundaries, which are deleterious to transport. [1] K.A. Ritter and J.W. Lyding, Nat. Mat. 8, 235 (2009). [2] J. Bai et al., Nano Lett. 9, 2083 (2009).

Joshua Wood
University of Illinois at Urbana-Champaign

Date submitted: 19 Nov 2010 Electronic form version 1.4