Abstract Submitted
for the MAR14 Meeting of
The American Physical Society

Graphene grain boundary resistivity revealed by scanning tunneling potentiometry CORENTIN DURAND, KENDAL W. CLARK, XIAOGUANG ZHANG, IVAN V. VLASSIOUK, AN-PING LI, Oak Ridge National Lab, OAK RIDGE NATIONAL LAB TEAM — All large-scale graphene films contain extended topological defects dividing graphene into domains or grains. Here, we study grain boundary (GB) resistivity in CVD graphene on Cu subsequently transferred to a SiO2 substrate. By using a scanning tunneling potentiometry (STP) setup with a cryogenic four-probe STM, the spatial variation of the local electrochemical potential is resolved across individual GBs on a graphene surface in the presence of a current [1]. The 2D distributions of electric field and conductivity were then numerically extracted by solving conduction equations. The derived conductivity of individual grains was compared to that measured with microscopic four-probe STM method to provide a model-independent determination of conductivity map for specific type of defect in graphene. The resistance of a GB is found to change with the width of the disordered transition region between adjacent grains. A quantitative modeling of boundary resistance reveals the increased electron Fermi wave vector within the boundary region, possibly due to boundary induced charge density variation. [1] K. W. Clark et al. ACS Nano 2013, 7, 7956

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Date submitted: 15 Nov 2013

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