

Abstract Submitted  
for the MAR14 Meeting of  
The American Physical Society

**A spectroscopic study of graphene nanoribbon formation on gold**

DEAN CVETKO, ALOISA Beamline, Elettra Synchrotron, Trieste, Italy, ARUNABH BATRA, OLGUN ADAK, Dept. of Applied Physics and Applied Mathematics, Columbia University, NYC, GREGOR KLADNIK, ALBERTO MORGANTE, ALOISA Beamline, Elettra Synchrotron, Trieste, Italy, LATHA VENKATARAMAN, Dept. of Applied Physics and Applied Mathematics, Columbia University, NYC — We study the formation of graphene nanoribbons (GNRs) on Au(110) and Au(111) via the covalent self-assembly of 10,10'-dibromo-9,9'-bianthryl (DBBA), a halogenated precursor molecule. We follow each step of the debromination, polymerization, and dehydrogenation in detail and show that Br-C bonds on the DBBA cleave at temperatures as low as 60C, much lower than that reported in previous STM-based measurements. Through x-ray photoemission spectroscopy (XPS) core-level shifts, we establish that the resulting radicals bind to Au, pointing to the formation of the Au-C and Au-Br bonds. We show that Br desorbs from Au(111) and Au(110) at 230-250C, much lower than previously predicted. Importantly, we find that polymerization and dehydrogenation of precursors proceeds only after removal of halogens from Au, suggesting that the presence of halogens is the limiting factor in this step. Finally, we use angle-resolved ultraviolet photoemission spectroscopy (ARUPS) to study the electronics of the GNR/Au interface and show that the interaction results in a shift in the 'surface state' of Au(111) towards  $E_{\text{fermi}}$  by 0.2 eV and a broadening due to increased electron effective mass. These experiments allow us to quantify the strength of the GNR-Au interaction.

Arunabh Batra  
Dept. of Applied Physics and Applied Mathematics, Columbia University, NYC

Date submitted: 15 Nov 2013

Electronic form version 1.4