Self-Organized Graphene Nanoribbons on SiC(0001) Studied with Scanning Tunneling Microscopy

DAVID TORRANCE, BAIQIAN ZHANG, TIEN HOANG, PHILLIP FIRST, Georgia Institute of Technology — Graphene nanoribbons grown directly on nanofacets of SiC(0001) offer an attractive union of top-down and bottom-up fabrication techniques. Nanoribbons have been shown to form on the $< 1\bar{1}0n >$ facets of templated silicon carbide substrates, but also appear spontaneously along step-bunches on vicinal SiC(0001) mis-cut slightly towards $< 1\bar{1}00 >$. These self-organized graphene nanoribbons were characterized with low-energy electron diffraction (LEED) and Auger electron spectroscopy (AES) in ultra-high vacuum. Our measurements indicate that the graphene forms a continuous “buffer layer” across the SiC(0001) terraces during nanoribbon formation, with the zigzag edge of the buffer layer aligned parallel to the step-bunched nanofacets. Scanning tunneling microscopy/spectroscopy (STM/STS) was used to characterize the topography and electrical characteristics of the graphene nanoribbons. These measurements indicate that the graphene nanoribbons are highly-crystalline with predominantly zigzag edges.

1Work supported by the NSF and the NRI-INDEX  