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Epitaxial graphene growth on several SiC surface orientations at high and ultrahigh vacuum pressure ANDREAS SANDIN, ZHENGANG WANG, XIANHUA KONG, J.E. (JACK) ROWE, NC State University — We use Scanning Tunneling Microscopy (STM) and Atomic Force Microscopy (AFM) measurements on several SiC surface orientations and have measured an Auger Electron Spectroscopy (AES) signature confirming the formation of graphene at high ($\sim 10^{-8}$ torr) and ultrahigh ($\sim 10^{-10}$ torr) vacuum pressure. In addition, low energy electron diffraction (LEED) and ex situ AFM have been used *in situ* to characterize the graphene layers. Sample preparation and characterization both *in situ* and *ex situ* is an important prerequisite for a final uniform graphene film. A chemical mechanical polish of the initial SiC gives atomically flat surfaces with SiC bilayer-step heights. *In situ* direct current annealing at ~900 C is performed to remove the native oxide and further prolonged annealing activates step flow growth of graphene on SiC. The decomposition of Si on bare SiC is shown to be more rapid at higher pressures possibly due to residual gases such as CO and H_2O while having much less effect on the 6sq root3 surface reconstruction due to its inert properties. AES is combined with STM to characterize the surface morphology combined with LEED to image surface graphene layer transformations. The half-cell stacking-fault symmetry appears to be preferred on the Si polar face as reported by others and gives the most uniform graphene growth.

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