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STM Properties and Manipulation of Epitaxial Graphene[1]

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Epitaxial graphene grown on SiC has been identified as one of the most likely avenues to graphene-based electronics. Understanding how morphology affects electronic properties is therefore important. In our work, epitaxial graphene was grown on the polar and non-polar a-, m-, and r-crystallographic oriented surfaces of SiC, and was investigated using scanning tunneling microscopy (STM). Bunched nano-ridges ten times smaller than previously recorded were observed throughout the surface. A new STM technique called electrostatic-manipulation scanning tunneling microscopy (EM-STM) was performed to modify the morphology of the nano-ridges. By modeling the electrostatics involved in the EM-STM measurement, we estimate that a force of 5 nN and energy of 10 eV was required to alter the local interfacial bonding. At the atomic scale, STM images of Moire patterns reveal low-angle, twisted bi-layer graphene, grain boundaries, and an apparent lattice constant dilation. We will show that this dilation is due to the STM tip electrostatically dragging the graphene surface. Collaborators: P. Xu, D. Qi, M.L. Ackerman, S.D. Barber, J.K. Schoelz, and J. Thompson, Department of Physics, University of Arkansas, Fayetteville, AR, 72701, USA; V.D. Wheelr, R.L. Myers-Ward, C.R. Eddy, Jr., and D.K. Gaskill, U.S. Naval Research Laboratory, Washington, DC 20375, USA; and L.O. Nyakiti, Texas A&M University.

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