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Ultrahigh Vacuum Growth and PEEM Characterization of Patterned Graphene Nanostructures on Si-Polar 6H-SiC Surfaces ZHENGANG WANG, ANDREAS SANDIN, JOESEPH TEDESCO, XIANHUA KONG, J.E. (JACK) ROWE, NC State University — We report the growth and Photoelectron Emission Microscopy (PEEM) characterization of graphene films on Si-polar surfaces of 6H-SiC by thermal decomposition in an ultrahigh vacuum (UHV) chamber. Following growth, focused ion beam lithography has been used to successfully etch the graphene films and control the lateral dimensions of a number of nanostructures on these graphene layers with etch rates of ∼18 nm/s and lateral dimensions of ∼250 to 1500 nm. Epitaxial graphene films (1-4 layers thick) have been grown on the Si face. Theoretical reports have recently addressed the bandgap engineering of graphene nanoribbons by altering the physical dimensions, edge structure, and edge atoms of the nanoribbons. However, experimental control of the growth and quality graphene nanostructures is still a challenge. Our PEEM results show that the electronic properties of the graphene are very different near step edges which indicates that some confinement effects expected for graphene nanoribbons may be achieved by selected stepped surfaces. The patterned surfaces show additional sites that are chemically different and may be useful for certain sensor applications. Possible interpretations of the PEEM contrast mechanisms will be discussed.

John Rowe
NC State University

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