

MRSEC SEMINAR SERIES

Growth of Low-Dimensional Carbon Nanomaterials

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Abstract:

Low dimensional carbon nanostructures, carbon nanotubes (CNTs) and graphene, have attracted significant interest due to promising applications ranging from high-speed electronics to sensing. However, insight into growth mechanisms of low-dimensional carbon nanomaterials remains a challenge. Metal-free nanocarbon/SiC structures offer an excellent platform to gain a fundamental understanding of carbon nano-materials. In this talk, metal-free nanocarbon/SiC structures are used as a platform to gain a fundamental understanding of the growth mechanisms of CNTs and graphene. Specifically, an understanding and control of the SiC surface graphitization process and interface structure needs to be established. In this talk, we will focus on graphene growth on SiC (0 0 0 1) (Si-face) as a model system in comparison with aligned CNT growth on SiC. The experimental aspects for graphene growth, including vacuum and ambient growth environments, and growth temperature will be presented, then, proposed decomposition and growth mechanisms will be discussed. Both thermal and chemical decomposition processes will be presented and special emphasis will be given to the role of oxygen. The chemical reactions driving the graphitization process and ultimately the carbon nanostructure growth on SiC will be discussed. The composition of the residual gases in the growth environment is a critical parameter as well as gas composition at the growth temperature.