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Graphene synthesis, characterization, and processing: an atomic-scale investigation

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Graphene is nature's ideal two-dimensional conductor that is comprised of a single sheet of hexagonally packed carbon atoms. Since the first electrical measurements made on graphene, researchers have been trying to exploit the unique properties of this material for a variety of applications that span numerous scientific and engineering disciplines. In order to fully realize the potential of graphene, large scale synthesis of high quality graphene and the ability to control the electronic properties of this material on a nanometer length-scale remain key challenges. This talk will focus on atomic-scale characterization of graphene synthesis on various materials (SiC, Cu(111), Cu foil, etc) via scanning tunneling microscopy. These fundamental studies explore growth dynamics, film quality, and the role of defects. The chemical modification of graphene following exposure to atomic hydrogen will be discussed, while additional emphasis will be made on graphene's unique structural (not electronic) properties.