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Scanning Probe Microscopy studies of 2D and quasi-2D graphene crystal structures. ELENA POLYAKOVA, Columbia University, YUANBO ZHANG, University of California Berkeley , MELINDA HAN, PHILIP KIM, GEORGE FLYNN, Columbia University, COLUMBIA UNIVERSITY, NSEC COLLABORATION, COLUMBIA UNIVERSITY, CHEMISTRY COLLABORATION — In these studies we utilize a variety of Scanning Probe techniques to observe evolution of material properties as a result of transitions from 3D to 2D crystal structures. Graphite is an ideal candidate for these studies as its stand alone 2D crystal (graphene) and quasi-2D films are conductive, stable, and chemically inert under ambient conditions. These crystals can be easily deposited on an oxidized silicon wafer, and the number of atomic layers can be precisely counted. Specific examples will be given to relate local and mesoscopic properties of these crystals as a function of the number of graphene monolayers forming the crystal. The role of the interaction between the substrate and graphene films will be considered. The finite thickness of crystals allows us to examine defects formed not only on the surface of the film but also below the topmost layer. Attenuation of corrugation in Scanning Tunneling images by overlayers of graphene is described. Compatibility of graphene films with atomic-scale electronics will be discussed.

Elena Polyakova
Columbia Uneresity

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