Spatially Controlled Growth of 2D Materials

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In the first half of my talk, I will discuss a new low temperature crystallization process for 2D semiconductors, MoS_2. To achieve this, solutions are produced from newly designed single source molecules that is then decomposed into a metastable state after spin coating on a variety of surfaces. These films can then be directly converted into MoS_2 using low temperature thermal annealing in a furnace or through direct laser writing. Moreover, I will describe a new platform to achieve spatial selectivity during the growth of 2D materials through subsurface engineering of graphene. Specifically, I will discuss the influence of subsurface gallium on modulating the surface energy of transferred CVD graphene onto a diamond like carbon (DLC) substrate containing implanted gallium ions in uniquely designed spatial structures. By carefully engineering the subsurface elements underneath graphene, one can take advantage of electro- and mechano-chemical changes to graphene to create surface energy gradients that will dictate the diffusion and selective reaction of chemical species during growth of chalcogenide 2D materials.