

Materials Science of Two Dimensional Atomic Layers

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There has been tremendous interest in recent years to study isolated two-dimensional atomic layers which form the building blocks of many bulk layered materials. This interest was initiated by the spectacular discovery of graphene which has been demonstrated to have a unique set of properties. This talk will focus on the materials science of graphene and the emerging field of 2D atomic layers beyond graphene. Our group has been working on 2D materials systems such as graphene, graphene oxide, boron-nitrogen-carbon containing materials and several compositions of transition metal dichalcogenides. Several aspects that include synthesis, characterization and device fabrication of these systems will be discussed with the objective of building all 2D functional structures for future technologies. There are several challenges in growing and fabricating devices with 2D atomic layers, including scalability, uniformity, defects, stability, stacking, contacts etc. and the talk will discuss these issues and the progress made in addressing these. The concept of nanoscale engineering and the goal of creating new artificially stacked van der Waals solids will be discussed through a number of examples including graphene and other 2D layer compositions.