Nanomechanics in the flatland : application to graphene and its derivatives

Vivek Shenoy, Brown University

Free standing crystalline 2D materials such as graphene and its derivatives (e.g. graphane, graphene oxide), BN and composites of these materials have received attention for their potential applications in logic, energy storage and optoelectronics. Many of the fascinating and important physical propertiesof these materials depend on the geometrical structure of the flat crystalline membrane, and can be altered by its deformation. In contrast to other low dimensional structures such as nanotubes, 2D sheets are very flexible, “flimsy” structures. Deformations can be caused by various factors, including thermal fluctuations or chemical functionalization and defects. In this talk I will discuss our work on ripples, buckles and warps in single component and compound 2D sheets induced by the presence of edges [1], heterointerfaces and adatoms. The effect of strain induced by functionalized atoms and defects on chemical reactivity [2] and mechanical [3], thermal [4] and electronic properties [5] will be discussed.

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