**Two-dimensional Nanomaterials-Why so promising?**

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With the rapid development of modern nano-scale electronic devices in recent decades, research efforts have been focused on exploring nanomaterials with physical properties not yet seen from conventional materials. Graphene, a representative two-dimensional (2D) nanomaterial still remains as a tantalizing candidate to be actively utilized in electronic applications despite its superb electronic properties stemming from its massless Dirac Fermions simply due to its linear gapless band spectrum. In this talk, we introduce an efficient scheme of forming and fine-tuning a bandgap in graphene for a range suitable for most applications by using slow alkali metal ions. We also demonstrate briefly the use of this ion-based technique to artificially control the size of band gap of a semiconducting MoS2, another leading example of 2D nanomaterials. Our density-functional theory calculations for the ion-induced changes in the band structure suggest the physical origin that drives such ion-induced band gaps.

**Keywords : 2D nanomaterials, graphene and MoS2, Alkali metal ion, Band gap control**