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Band-gap engineering for graphene by using low energy alkali metal ions

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Despite its superb electronic properties over other materials, graphene still remains as a tantalizing candidate to be actively utilized in electronic applications mainly because of its linear gapless band spectrum. Since the massless Dirac fermions in graphene showing ballistic charge transport even at room temperature are ideal charge carriers for fast circuit devices, extensive research efforts have been made to open a tunable bandgap in graphene with several different schemes. In this talk, we introduce a new scheme of forming and fine-tuning a bandgap for a range suitable for most applications by using slow alkali metal ions. We also demonstrate the on-off switching capability by controlling the size and mid-gap energy (or Dirac point) of the bandgap independently by adding other neutral atoms. Our density-functional theory calculations for the band suggest that the sublattice asymmetry enhanced by the doped ions drives the behavior of the ion-induced bandgap in graphene.

Biography

Jinwook Chung has completed his PhD at the age of 32 years from Brown University and postdoctoral studies from Massachusetts Institute of Technology in USA. He is the director of Surface and Nanomaterial Physics Lab, Pohang Institute of Science and Technology in Korea. He has published more than 96 SCI papers in reputed journals and has been serving as an editorial board member of several journals including Applied Physics A (1997~2003), Science Letters (2014~), and Madridge Journal of Nanotechnology & Nanoscience (2016).

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