Abstract Submitted
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Bandgap opening in bilayer graphene via molecular doping[1]
DAVID CAREY, ALEXANDER SAMUELS, University of Surrey — We report the emergence of an electronic bandgap in bilayer graphene through the interaction with physisorbed molecules. The bandgap is found to scale linearly with induced carrier density though a slight asymmetry is found between n-type dopants where the bandgap varies as 47 meV/10^{13} cm^{-2} and p-type dopants where the bandgap varies as 38 meV/10^{13} cm^{-2}. The n-type dopant molecules include tetrathiafulvalene (TTF), cobaltocene and decamethylcobaltocene (DMC) and p-type dopant molecules include NO_2, 2,3-dichloro-5,6-dicyano-1,4-benzoquinone (DDQ) and 3,6-difluoro-2,5,7,7,8,8-hexacyano-quinodimethane (F2-HCNQ). Ammonia is found to be weak amphoteric dopant on bilayer graphene, as it is on single layer graphene, where the charge transfer depends on the orientation of the N atom relative to the upper graphene layer. The bandgap opening is explained in terms of the asymmetric charge distributions on the upper graphene layer which is in contact with the molecules. The high binding energy found upon adsorption of some of these molecules results in an attractive way to a permanent bandgap and when combined with a variable external electric field can either close the gap or widen it still further.

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