

Graphene, the theorist's pencil

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ABSTRACT:

Graphene, a single atomic layer of two-dimensional carbon atoms arranged in a hexagonal array, has emerged in the past couple of years as a fascinating nanomaterial, both from the fundamental point of view and for its potential applications in nanoelectronics. When graphene is folded up, it forms a single-walled carbon nanotube, a one-dimensional system. These one- and two-dimensional nanomaterials exhibit many intriguing properties, driving tremendous growth in experimental and theoretical activity. Because of the special geometry of the hexagonal lattice, the energy band structure of graphene is such that its valence and conduction bands touch each other at only six points found at the six corners of its hexagonal Brillouin zone. The intersection of these two energy bands yields to a linear dispersion relation E vs. k , which sets graphene apart from other materials. I will give a general introduction on graphene and its electronic structure, comparing it with a conventional 2D electron gas. I will draw some parallels between properties of graphene and carbon nanotubes. Also, I will present the energy band structure of graphene obtained applying the tight binding approximation. To generate the energy spectrum, I wrote a software program in Fortran.

KEYWORDS: graphene, nanomaterials, tight-binding approximation, solid state physics

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