Emergent Dirac fermions in epitaxial silicene

Mariusz Krawiec [1]

[1] *Institute of Physics, Maria Curie-Sklodowska University, pl. M. Curie-Sklodowskiej 1, 20-031 Lublin, Poland*

Silicene, a Si-counterpart of graphene, is one-atom-thick two-dimensional material in which Si atoms form a honeycomb lattice [1]. Its freestanding atomic structure is low-buckled, although planar form has also been predicted as a metastable structure [2]. Similar to graphene, both forms of silicene feature linear Dirac-like bands in their electronic structures. So far silicene has been synthesized only on a few, mainly metallic, substrates in the epitaxial form, with substantially altered structural and electronic properties [3].

Here the issue of the first experimental evidence of the planar form of silicene will be discussed. This new silicon allotrope has been synthesized on Au(111) thin films grown on Si substrate in the process of surface segregation [4]. Its electronic structure is different than in the case of freestanding form. Nevertheless the linear bands do exist, although they exhibit more complex dispersion patterns in Brillouin zone. The presence of such exotic Dirac fermions originates from silicene-substrate interaction.

This planar form of silicene is a part of a more complex layered Si-Au heterostructure with twisted layeres [5].

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