POSSIBILITY OF SUPERCONDUCTIVITY IN DOPED TWISTED BILAYER GRAPHENE

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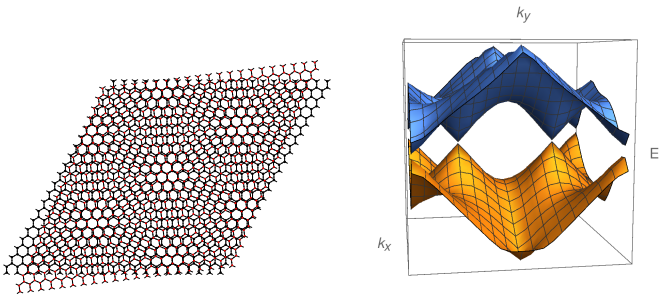
Finding a room-temperature superconductor is one of the ultimate goals in materials physics. Lately, hints of this have been experimentally observed in the ordinary material graphite, which consists of multiple stacked graphene sheets. According to the experiments, superconductivity seems to take place at the graphene interfaces [1], and especially at interfaces where the stacking angle changes [2]. This motivates the study of *twisted bilayer graphene*, which exhibits a fascinating Moiré pattern (see Fig. 1a). This periodic pattern is responsible for intriguing electronic properties, and it allows for tuning the band structure by twisting angle [3].

As seen in Fig. 1b, the band structure contains saddle points, also known as van Hove singularities, *i.e.* energies whose corresponding density of states is infinite, indicating possible superconductivity. Normal graphene also has van Hove singularities, but they are fixed to high energies, making them difficult to reach *e.g.* by doping. In twisted bilayer graphene, however, the situation is very different since the energy of the singularities can be continuously tuned by changing the twisting angle. Most importantly, for small twisting angles the energy of the singularity is close to zero, making it easy to reach even with very light doping.

By using a simple tight-binding model [3] and standard BCS theory, we discuss the possibility of superconductivity in these slightly doped twisted bilayer graphene systems.



(a) (b)

Figure 1: Moiré pattern in twisted bilayer graphene and the resulting band structure.

[1] T. Scheike *et. al.*, Carbon **59**, 140 (2013).
[2] P. Esquinazi *et. al.*, Pis'ma ZhETF **100**, 374 (2014)
[3] J. M. B. Lopes dos Santos *et. al.*, Phys. Rev. B **86**, 155449 (2012)