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Title: Twisted multilayer graphene revisited: where is the “magic”?

Abstract: We revisit the physics of twisted bilayer and trilayer graphene, from an ab initio perspective. In twisted bilayer graphene (tBLG), the moiré pattern observed experimentally clearly shows the formation of different types of domains which can be explained by the atomic relaxation, both in-plane and out-of-plane, using continuum elasticity theory and the Generalized Stacking Fault Energy (GSFE) concept. The relaxation significantly affects the electronic states, leading to a pair of flat bands at the charge neutrality point which are separated by band gaps from the rest. We argue that these features appear for a small range of twist angles, that we call the “magic range” around 1θ . For twisted trilayer graphene (tTLG) the situation is considerably more complicated, with a moiré-of-moiré pattern emerging for different twist angles. We discuss how the details of the band structure can be crucial for understanding the origin of correlated states and superconductivity in tBLG and tTLG. We also derive a minimal effective tight-binding model that can capture the single-particle physics and explore its implications for correlated electron behavior.