APS March Meeting 2020

View Abstract

CONTROL ID: 3304832

TITLE: Topological Floquet engineering of twisted bilayer graphene

Abstract Body: We investigate the topological properties of Floquet-engineered twisted bilayer graphene above the magic angle driven by circularly polarized laser pulses. Employing a full Moiré-unit-cell tight-binding Hamiltonian based on first-principles electronic structure, we show that the band topology in the bilayer, at twisting angles above 1.05 degrees, essentially corresponds to the one of single-layer graphene. However, the ability to open topologically trivial gaps in this system by a bias voltage between the layers enables the full topological phase diagram to be explored, which is not possible in single-layer graphene. Circularly polarized light induces a transition to a topologically nontrivial Floquet band structure with the Berry curvature analogous to a Chern insulator. Importantly, the twisting allows for tuning electronic energy scales, which implies that the electronic bandwidth can be tailored to match realistic driving frequencies in the ultraviolet or midinfrared photon-energy regimes.

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PRESENTATION TYPE: Oral

UNIT: 12.0 COMPLEX STRUCTURED MATERIALS, INCLUDING GRAPHENE (DCMP)

SORTING CATEGORY: 12.10.00 : 2D Materials: Moire systems

Category Type: Theoretical

AUTHORS (FIRST NAME, LAST NAME): Michael Sentef[1], Gabriel E. Topp[1], Gregor Jotzu[1], James W. McIver[1], Lede Xian[1], Angel Rubio[1]

INSTITUTIONS (ALL): 1. Max Planck Inst Structure & Dynamics of Matter

Teams: (none)