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【171】 Topologically fragile flat bands through adatom superlattice engineering on graphene

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Magic-angle twisted bilayer graphene has received a lot of attention due to its flat bands that lead to intricate correlated phases. However, control over the system parameters of such devices is limited. We propose a single graphene sheet with adatoms periodically placed on top as an alternative system that realizes flat bands. Performing first principle calculations, we obtain realistic spectra for feasible transition-metal adatoms. Further group-theoretical analysis reveals the fragile nature of topology of flat bands. We study the bulk-boundary correspondence associated with the fragile topology of the flat bands and numerically examine the corner-localized in-gap states, which are a consequence of the filling anomaly resulting from the nontrivial topology.

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