Engineering and probing new phases in twisted heterostructures of graphene and transition metal dichalcogenides

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Abstract

Twisted van der Waals heterostructures have enriched the phase space of two-dimensional (2D) materials by introducing a new knob to engineer Coulomb interaction, structural symmetry breaking, to electron-phonon interaction, among others. Partnering different genres of 2D materials provides further flexibility in introducing spin-orbit interaction, topological properties etc. The resulting structures are not just ideal platforms for new fundamental discoveries, but also for designing novel device architectures. In this talk, I shall cover a range of such devices, where partnering of twisted bilayers of graphene or transition metal dichalcogenides leads to new correlated phases at unconventional band filling, as well as unexpected device properties when incorporated in field effect devices. The novelty of these properties is probed with multiple experimental techniques, such as thermoelectricity and electrical transport.

References

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