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Moire-Wigner-Mott freezing in transition-metal dichalcogenide heterobilayers

VLADIMIR DOBROSAVLJEVIC, Florida State University

The Moire pattern induced by lattice mismatch in transition-metal dichalcogenide heterobilayers causes the formation of flat bands, where interactions dominate the kinetic energy. At fractional fillings of the flat valence band, the long-range Coulomb interaction then induces generalized Wigner crystals or frozen electron glasses. On top of these charge ordering patterns, electrons on occupied site experience strong Mott correlations. Here, we use a combination of first-principle modelling with strong-coupling many-body theory to study the interplay of Moire Wigner and Mott physics. At certain commensurate fillings (e.g. n=1/3) we find periodic Wigner-Mott states and a crossover to heavy Fermi liquids in their vicinity. At other fillings we also identify metastable inhomogeneous (glassy) charge ordering with a characteristic weak bad metal behavior.