Magic-angle Helical Trilayer Graphene as A New Platform for realizing Correlated Topological States of Matter

X. Li[1], R. Plumadore[1], L. Molino [1], S. Walker[1], A. Luican-Mayer[1]

[1]*Department of Physics, University of Ottawa, Ottawa, Ontario K1N 6N5, Canada*

xli584@uottawa.ca

When layers of two-dimensional materials are stacked together with a relative twist or with a lattice mismatch, a moiré pattern arises, and the electronic properties of the material will be modified. Recently, helical trilayer graphene (HTG) consisting of three layers of graphene with identical magic-angle twists between consecutive layers, has been proposed as a promising platform for experimentally realizing correlated topological states [1].

Here, we present our progress in realizing HTG heterostructures as well as in their characterization using scanning probe microscopy. For these devices, we use monolayer graphene and hexagonal boron nitride (hBN) with a thickness of about 40nm, exfoliated on Si/SiO_2 substrates, picked up sequentially and transferred onto a clean gold-coated substrate. For surface cleaning, we perform high temperature forming gas annealing and high vacuum annealing. For characterization, we use a combination of atomic force microscopy and scanning tunneling microscopy to understand both the morphology of the HTG as well as details about its electronic band structure.

References

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