Measuring local moiré lattice heterogeneity of twisted bilayer graphene

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It was proposed that superconductivity can emerge in moiré lattices even if it is absent in their building blocks [1,2], and several materials have been discovered recently where this is the case. These real-world materials differ from the ideal case, and are often thought to be rather heterogenous. In this talk, I will present a new method to continuously map inhomogeneities of a moiré lattice and apply it to large-area topographic images we measure on open-device twisted bilayer graphene (TBG). We show that the variation in the twist angle of a TBG device, which is frequently conjectured to be the reason for differences between devices with a supposed similar twist angle, is about 0.08° around the average of 2.02° over areas of several hundred nanometers, comparable to devices encapsulated between hexagonal boron nitride slabs [3]. We distinguish between an effective twist angle and local anisotropy and relate the latter to heterostrain. Our results imply that for our devices, twist angle heterogeneity has an effect on the electronic structure roughly equal to that of local strain. The method introduced here is applicable to results from different imaging techniques and on different moiré materials.

References

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