Van der Waals heterostructures are a unique arena which is constantly revealing new physics.[1] Crystallographic alignment between neighbouring crystals is a parameter that has been shown to exhibit superlattice Dirac peaks,[2] the renowned Hofstadter butterfly[3] and topological currents.[4] Since then, closer attention has been paid to the mechanics of constituent crystal interactions. In particular, graphene exhibits a mechanical stretching of its lattice to conform to the potential of an hexagonal boron nitride (hBN) substrate when crystallographically aligned,[5] and it macroscopically rotates to align with hBN when they have a \(\theta \approx 1-2^\circ\) mis-alignment.[6]

We are developing devices (Fig. 1) that electrostatically move graphene across hBN allowing us to study the mechanical interactions between flakes and provide dynamic control of flake morphology. Using a combination of AFM, raman and electrical transport measurements, we present our findings and identify routes of future study. There are a number of applications for these devices, primarily in nanomechanical actuators.

References


Figures

Figure 1: Cartoon of one of the types of device we have fabricated and studied.