Enabling Moiré and Atomic Lattice Imaging in 2D Materials with Torsional Force Microscopy

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Torsional Force Microscopy (TFM) is an advanced Atomic Force Microscopy (AFM) technique designed to detect dynamic frictional forces at the nanoscale. TFM excels at imaging both moiré superlattices and atomic lattices in van der Waals heterostructures, such as bilayer graphene and graphene/hexagonal boron nitride systems, where subtle changes in twist angle can drastically affect electronic properties. Unlike conventional methods, TFM does not require electrical contact between the probe and the sample, making it ideal for characterizing insulators and floating structures. This non-invasive technique enables high-resolution examination of 2D materials on polymer substrates, even during intermediate fabrication stages, under ambient conditions. In this presentation, we introduce the principles of TFM and demonstrate its capabilities using Park Systems' AFM.