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Rotatable van der Waals Heterostructures

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Abstract

Layered van der Waals heterostructures of two-dimensional materials provide opportunities to achieve properties beyond what is achievable in conventional materials. Recently, interlayer twist has emerged as a powerful tuning knob for electronic and optical properties. This talk will describe our recent work in creating and studying rotatable heterostructures, in which the interlayer twist angle can be manipulated using an atomic force microscope, allowing study across multiple angles in a single device. Using this technique, we have manipulated the moiré patterns between graphene and hBN[1], and studied the effects of different symmetry when top and bottom hBN layers are both aligned to the graphene[2]. Recent results in which the optical properties of heterostructures are controlled through interlayer rotation will also be described.

1. Ribeiro-Palau, R., C.J. Zhang, K. Watanabe, T. Taniguchi, J. Hone, and C.R. Dean, "Twistable electronics with dynamically rotatable heterostructures", Science 361, 690-693 (2018).
2. Finney, N.R., M. Yankowitz, L. Muraleetharan, K. Watanabe, T. Taniguchi, C.R. Dean, and J. Hone, "Tunable crystal symmetry in graphene-boron nitride heterostructures with coexisting moire superlattices", Nature Nanotechnology 14, 1029 (2019).