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Friction Forces Between Atomically Flat 2D Materials KURSTI DELELLO, REBECA REBEIRO-PALAU, TARUN CHARI, Columbia University, KENJI WATANABE, TAKASHI TANIGUCHI, National Institute for Material Science, JAMES HONE, KEN SHEPARD, CORY DEAN, Columbia University — The ability to fabricate layered heterostructures from the assembly of 2D crystals has emerged as an exciting new opportunity in materials synthesis. Held together by van der Waals (wdW) forces, virtually any of the materials that can be exfoliated to the single atom limit can be integrated with one another into heterogeneous structures. This allows unprecedented opportunity to mix and match material properties, unbounded by the challenges inherent to the growth process of conventional semiconductor heterostructures, such as interfacial chemistry and lattice matching. However, to date surprisingly little is known about the interfacial interactions of these new structures. Here we investigate the angular dependence of friction between two atomically flat 2D materials with different lattice constants, (eg. graphene, h-BN, WSe_2, WS_2, etc) using atomic force microscopy, and propose it as a method to probe vdW interactions. We show that the friction signal increases close to alignment, and is much lower for large angles, despite no direct atomic overlap, suggesting a relationship between the friction force and the presence of a moiré superlattice.

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