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Probing interlayer interactions in WS2-graphene van der Waals heterostructures TING FUNG CHUNG, LONG YUAN, LIBAI HUANG, YONG P. CHEN, Purdue University — Two-dimensional crystals based van der Waals coupled heterostructures are of interest owing to their potential applications for flexible and transparent electronics and optoelectronics. The interaction between the 2D layered crystals at the interfaces of these heterostructures is crucial in determining the overall performance and is strongly affected by contamination and interfacial strain. We have fabricated heterostructures consisting of atomically thin exfoliated WS2 and chemical-vapor-deposited (CVD) graphene, and studied the interaction and coupling between the WS2 and graphene using atomic force microscopy (AFM), Raman spectroscopy and femtosecond transient absorption measurement (TAM). Information from Raman-active phonon modes allows us to estimate charge doping in graphene and interfacial strain on the crystals. Spatial imaging probed by TAM can be correlated to the heterostructure surface morphology measured by AFM and Raman maps of graphene and WS2, showing how the interlayer coupling alters exciton decay dynamics quantitatively.

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