Abstract Submitted
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In-situ electrostatic doping in 2D semiconductor heterostructures determined by micro-ARPES PAUL NGUYEN, University of Washington, NEIL WILSON, NATALIE TEUTSCH, University of Warwick, GABRIEL CONSTANTINESCU, University of Cambridge, VIKTOR KANDYBA, ALEXEY BARINOV, Sincrotrone Elettra Trieste, NICHOLAS HINE, University of Warwick, XIAODONG XU, DAVID COBDEN, University of Washington — Understanding the behavior of 2D devices calls for probing the local electronic spectrum and how it is affected by bias. The most powerful technique for determining band structure is angle-resolved photoemission (ARPES), which can now be applied to micron-scale, electrically contacted samples, for example at Spectromicroscopy beamline, Elettra . Using this facility, and by designing samples with electron-transparent monolayer graphene or hBN caps for protection, we have studied heterostructures of WS_2, MoS_2, $MoSe_2$ and graphene that are back-gated with a thin graphite electrode through an h-BN dielectric. Using the gate we reversibly tuned in-situ in the ARPES chamber the carrier density in graphene up to $\pm 2\times 10^{13}$ cm^{-2} and measured field induced changes in band alignments in heterostructures. We were also able to electrostatically populate the conduction band in MoS_2, revealing a direct gap at the K-point of 2.1 $\pm$ 0.1 eV, in good agreement with recent STM measurements.

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