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SPE-LEEM Studies on the Surface and Electronic Structure of 2-D Transition Metal Dichalcogenides[1] PO-CHUN YEH, WENCAN JIN, NADER ZAKI, DATONG ZHANG, Columbia University, JERZY SADOWSKI, ABDULLAH AL-MAHBOOB, Brookhaven National Laboratory, AREND VAN DE ZANDE, DANIEL CHENET, JERRY DADAP, IRVING HERMAN, Columbia University, PETTER SUTTER, Brookhaven National Laboratory, JAMES HONE, RICHARD OSGOOD, Columbia University — In this work, we studied the surface and electronic structure of monolayer and few-layer exfoliated MoS_2 and WSe_2, as well as chemical-vapor-deposition (CVD) grown MoS_2, using Spectroscopic Photoemission and Low Energy Electron Microscope (SPE-LEEM). LEEM measurements reveal that, unlike exfoliated MoS_2, CVD-grown MoS_2 exhibits grain-boundary alterations due to surface strain. However, LEEM and micro-probe low energy electron diffraction show that the quality of CVD-grown MoS_2 is comparable to that of exfoliated MoS_2. Micrometer-scale angle-resolved photoemission spectroscopy (ARPES) measurement on exfoliated MoS_2 and WSe_2 single-crystals provides direct evidence for the shifting of the valence band maximum from Γ to K, when the layer number is thinned down to one, as predicted by density functional theory. Our measurements of the k-space resolved electronic structure allow for further comparison with other theoretical predictions and with transport measurements.

[1]Session I and II

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