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Evolution of the Valley Position in Bulk Transition-Metal Chalcogenides and their Mono-Layer Limit Y.L. CHEN, Oxford University, H.T. YUAN, Stanford University, Z.K. LIU, ShanghaiTech University, G. XU, Stanford University, B. ZHOU, Advanced Light Source, Lawrence Berkeley National Lab, S.F. WU, University of Washington, D. DUMCENCO, National Taiwan University of Science and Technology, K. YAN, Stanford University, Y. ZHANG, S.-K. MO, Advanced Light Source, Lawrence Berkeley National Lab, P. DUDIN, Diamond Light Source, V. KANDYBA, M. YABLONSKIKH, A. BARINOV, Elettra Synchrotron Light Source, Z.X. SHEN, S.C. ZHANG, Stanford University, Y.S. HUANG, National Taiwan University of Science and Technology, X.D. XU, University of Washington, Z. HUSSAIN, Advanced Light Source, Lawrence Berkeley National Lab, H. Y. HWANG, Y. CUI, Stanford University — Layered transitionmetal chalcogenides have heavy elements with strong spin-orbit interaction, thus provide a unique way to extend functionalities of novel spintronics and valleytronics devices. Currently, most understanding of electronic bands near valleys is based on either theoretical calculations or optical measurements, leaving the detailed band structure elusive. In this talk, using angle-resolved photoemission spectroscopy with sub-micron spatial resolution, we systematically imaged the band structures and evolution across representative chalcogenides MoS_2, WS_2 and WSe_2, as well as the thickness dependent from bulk to the monolayer limit. These results establish a solid basis to understand the underlying valley physics of these materials, and also provide a link between their electronic structures and physical properties for potential applications.

Yulin Chen
Oxford University

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