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Title of the Presentation: Direct observation of the layer-number-dependent electronic structure in few-layer WTe_2

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Short Biography:

Masato Sakano holds a doctoral degree of engineering from The University of Tokyo. He finished his PhD at the Department of Applied Physics, The University of Tokyo in 2016. Thereafter, he worked as a postdoctral researcher at the Institute of Solid State Physics, The University of Tokyo (2016-2017). Since April 2017, he is a research associate at Quantum-Phase Electronics Center, The University of Tokyo. His present research is on studying the electronic structures in strongly spin-orbit coupled materials, topological materials and two-dimensional materials by means of photoemission spectroscopy, and developing the laser angle-resolved photoemission spectroscopy system.

Abstract:

In atomically-thin two-dimensional (2D) materials, the physical property varies discretely with each increase in the number of layers from monolayer to bulk. Few-layer WTe_2s [1,2] have stacking-order driven noncentrosymmetric crystal structures, leading to the peculiar Berry curvature related switchable functionalities such as the nonlinear anomalous Hall effect[3-5] and the ferroelectricity[6]. Although those transport properties are sensitive to the formation of the band dispersions near the Fermi level, it is difficult to accurately calculate the complex band structure of few-layer WTe_2 by the first principles calculations. In our study, by using micro-focused laser angle-resolved photoemission spectroscopy (ARPES) [7] in combination with the 2D materials manufacturing system that can freely stack atomic layers by image recognition, machine learning, and autonomous robots[8,9], we demonstrated the direct observations on the layer-number-dependent band dispersions of the 2–5 layer WTe_2. It revealed the sequential changes in the band structures exhibiting the even-odd nature of the number of layers and the insulator–semimetal transition.

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