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Electronic structure of atomic-layer VSe_2 studied by ARPES

The two-dimensional atomic-layer transition-metal dichalcogenides (TMDs) MX2 have been a target of intensive studies since they show novel physical phenomena such as Ising superconductivity [1], spin-valley hall effect [2] and Mott-insulator [3]. Amongst bulk TMDs, VSe_2 has been also studied since it exhibits a charge-density wave transition below ~200 K owing to conventional three-dimensional Fermi-surface nesting [4]. On the other hands, the physical properties of atomic-layer VSe_2 have not been investigated because of the difficulty in growing high-quality well-ordered atomic-layer materials. To elucidate physical properties of single-layer VSe_2, we have fabricated a monolayer film on bilayer graphene by molecular beam epitaxy, and characterized its electronic state by angle-resolved photoemission spectroscopy (ARPES) [4].

As shown in Figure 1, we clearly obseve several dispersive bands along the K-Γ-M high-symmetry line, indicative of the high-quality nature of our growth film. We aloso revealed a metal-to-insulator transition below 140 K in monolayer VSe_2.

In this talk, we will discuss the origin of metal-insulator transition in monolayer VSe_2 and also discuss the similarity and differences in the electronic states between monolayer and multilayer VSe_2.

References

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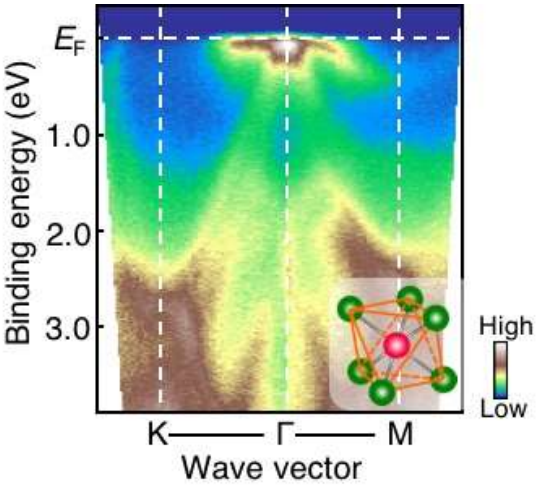

Figure 1: ARPES-intensity plot along the K-Γ-M cut as a function of wave vector and binding energy for monolayer VSe_2. Inset shows the crystal structure of monolayer VSe_2.