Van Hove Singularities Induced Large Electron-boson Coupling in $Cr_2Ge_2Te_6$

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Van Hove singularities (VHSs) in the electronic structure of 2D materials produce a divergent density of states that is prone to electronic instabilities when tuned to the Fermi level, and therefore often associated with a precursor of new ordered phases. However, despite the previous fruitful studies on this topic, it is still challenging to understand the effects of VHSs and directly compare them to theoretical predictions, often due to a mixing of VHSs with other coexisting bands as well as their existence in 3D bulk crystals. Here, we have investigated a clean single-band system with isolated VHSs in a ferromagnetic semiconducting material $Cr_2Ge_2Te_6$ (CGT). By surface alkali metal doping, we were able to tune the VHS to near the Fermi level, hence creating a genuine 2D system suitable for investigating VHS-induced novel states and their interplay with magnetism. In this talk, we will present our angle-resolved photoemission spectroscopy measurement via a step-by-step in situ potassium doping experiments on pristine CGT crystals, tuning the Fermi level to go across the VHS level and beyond, and discuss our observations of electron-electron correlations and electron-boson coupling effects.

Keywords: 2D magnet, alkali metal doping, ARPES, electron-boson coupling.