Exploring novel composite particles in two-dimensional crystals

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Two-dimensional (2D) van der Waals semiconductors have emerged as a class of materials with a tunable carrier density [1,2]. Carrier doping to 2D semiconductors can be exploited to modulate many-body interactions and to explore a novel composite particle. The Holstein polaron is a small composite particle of an electron that drags a cloud of self-induced phonons, which has been widely proposed to play a key role in high-temperature superconductivity. In this talk, I will introduce our recent angle-resolved photoemission spectroscopy (ARPES) studies on the discovery of Holstein polarons in surface-doped MoS₂ [3,4], where a puzzling 2D superconducting dome with the critical temperature of 12 K was found recently. The strength of electron-phonon coupling is found to increase along the superconductivity will be discussed.

References

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