Exploring novel composite particles in two-dimensional crystals

Keun Su Kim

Department of Physics, Yonsei University, Seoul 03722, Korea
keunsukim@yonsei.ac.kr

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 MoS_2 [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 superconducting dome up to the intermediate regime, and its potential relevance to the 2D superconductivity will be discussed.

References

[1] J. Kim *et al., Science* **349,** 723 (2015).
[2] J. Kim *et al., Phys. Rev. Lett.* **119,** 226801 (2017).
[3] M. Kang *et al., Nano Lett* **17,** 1610 (2017).
[4] M. Kang *et al., Nature Mater.* **17,** 676 (2018).