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The mystery of high temperature superconductivity at the FeSe/STO interface

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Interface and surface become important playgrounds for unconventional superconductivity, since they bring broken symmetry, competing orders, charge transfer, strain and other factors into the problem. Recently, interfacial superconductivity up to 75K has been discovered in FeSe/STO and FeSe/BTO interfaces [1,2]. In this talk, I will demonstrate that the combination of angle resolved photoemission spectroscopy (ARPES), scanning tunneling microscopy (STM) and molecular beam epitaxy (MBE) is a powerful tool to study the superconductivity at interfaces and surfaces. Specifically, I will present: our recent efforts in the understanding of the pairing symmetry of FeSe/STO [3] and the anomalous phase diagram of FeSe films upon surface electron doping [4,5]. Our results suggest that the interfacial effects, particularly interfacial electron-phonon interactions, may play a critical role in the high- T_c of FeSe/STO. In line with it, I will introduce our latest findings of the surprising interfacial structure of FeSe/STO.

- [1] S. Tan et al., Nature Materials 12, 634 (2013).
- [2] R. Peng et al., Nature Comm. 5, 5044 (2014).
- [3] Q. Fan et al., Nature Physics 11, 946–952 (2015).
- [4] C.-H.-P. Wen et al., Nature Comm. 7, 10840 (2016).
- [5] W. H. Zhang et al., Nano Lett. 16 (3), 1969–1973 (2016).

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