北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

STM Study of Correlated Oxide System Delafossite ABO_2

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腾讯会议链接: https://meeting.tencent.com/dm/oytYr0rx8WJh

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Abstract

The study of delafossite metals ABO_2 has recently attracted much attention in that they exhibit fruitful interesting properties, including the highly 2D transport properties and extremely long electron mean free path observed within the noble metal layers of $PtCoO_2$ and $PdCoO_2$ [1], making ballistic electron transport in the μm scale realizable. In this talk, I will discuss the results of my scanning tunneling microscopy (STM) studies of two different delafossite materials: $PdCoO_2$ and $PdCrO_2$.

First, I will report on a spectroscopic imaging study of the two-dimensional electron gas at the cobaltate surface of $PdCoO_2$, a correlated oxide system exhibiting giant Rashba-like spin-splitting [2]. Our data reveals a complex quasiparticle interference pattern which, in particular, comprises a rounded-hexagon shaped, hole-like scattering band that disperses with averaged effective masses of ~ -13.0 m_e and ~ -11.1 m_e along the Γ-K and Γ-M directions, respectively. Through comparison with the results of our tight binding calculations, we demonstrated that the scattering is well described by the pure spin-selection rules, instead of the spin-orbit selection results obeyed by conventional Rashba systems.

Then, I will report on STM findings on the Pd surface layer of $PdCrO_2$, a frustrated antiferromagnetic metal that exhibits $(\sqrt{3}\times\sqrt{3})R120^\circ$ AFM order throughout the Cr lattice. On the Pd surface layer, we observed a non-periodic tiling phase, whose formation was interpreted as due to surface-polarity-driven reconstruction. Its STM appearance and other properties will be discussed in detail.

[1] A. P. Mackenzie, *Rep. Prog. Phys.* **80**, 032501 (2017)

[2] V. Sunko *et al.*, *Nature* **549**, 492-496 (2017)

About the speaker

Prof. Dr. Chi Ming Yim received his PhD degree from University College London (UK) in 2012, then pursued postdoctoral research at UCL and University of St Andrews (UK). In 2020, Chi Ming joined Tsung-Dao Lee Institute, Shanghai Jiao Tong University, where he leads a low temperature STM group to study the exotic phenomena in strongly correlated electron materials at the atomic length scale. Chi Ming's group website: https://web.tdli.sjtu.edu.cn/cmyim/.