

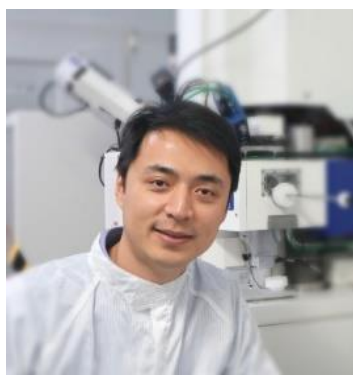


## Weekly Seminar

### Ultrathin high- $T_c$ superconductors and Josephson junctions

## Ding Zhang

*Department of Physics, Tsinghua University*



**Time: 3:00pm, Feb. 23, 2022 (Wednesday)**

**时间: 2022年2月23日 (周三) 下午3:00**

**Venue: Room W563, Physics building, Peking University**

**地点: 北京大学物理楼, 西563会议室**

### Abstract

The mechanism of high- $T_c$  superconductivity remains a challenging problem in condensed matter physics. Some of the fundamental issues, such as the pairing symmetry, remain unsettled. In this talk, we report our recent endeavors by using ultrathin  $\text{Bi}_2\text{Sr}_2\text{CaCu}_2\text{O}_{8+\delta}$  (BSCCO) superconductors. To study the pairing symmetry, we fabricate ultrathin twisted high- $T_c$  Josephson junctions with atomically flat interfaces. We demonstrate that the Josephson current solely arises from the coupling between the rotated double copper-oxide planes. Notably, the Josephson coupling strength reached the same level for different twist angles, indicative of an  $s$ -wave pairing [1] than the widely expected  $d$ -wave pairing. We further study the magneto-transport properties of BSCCO flakes across a wide doping regime. In the lightly doped regime, we observe Little-Parks like resistance oscillations [2]. This result is surprising as it indicates that a spatially periodic order emerges spontaneously in the system.

[1] Y. Zhu *et al.*, *Phys. Rev. X* **11**, 031011 (2021).

[2] M. Liao *et al.*, *Nat. Commun.* accepted (2022).

### About the speaker

Ding Zhang is an associate professor in Department of Physics, Tsinghua University. He did his PhD study in Max Planck Institute for Solid State Research, Stuttgart, Germany from 2008 to 2014. He then joined Tsinghua University as a post-doc. Since 2016, Ding Zhang started the tenure-track in Tsinghua University. He is an experimentalist in condensed matter physics, with the current interest in low-dimensional/high-temperature superconductivity, and low-temperature transport techniques. He was recognized as the "35 Innovators Under 35" by MIT Technology Review China in 2020.