北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Weekly Seminar

Cuprate high-temperature superconductivity in the extreme two-dimensional limit

Prof. Yuanbo Zhang

Fudan University

Time: 3:00pm, Mar. 16, 2022 (Wednesday)

时间: 2022年3月16日 （周三）下午3:00

腾讯会议 ID: 868-517-654

Tencent Meeting ID: 868-517-654

Abstract

Recent experiment has demonstrated that two CuO_2 planes in a monolayer $Bi_2Sr_2CaCu_2O_{8+\delta}$ (Bi2212) contain all essential physics of high-temperature superconductivity. Here, we study cuprate superconductor in the two-dimensional limit—monolayer of $Bi_2Sr_2CuO_{6+\delta}$ (Bi2201) that contains only one CuO_2 plane. The extreme thickness brings unprecedented tunability; we succeed in covering the entire phase diagram of Bi2201 with controlled oxygenation in a single monolayer specimen, enabling us to demonstrate an anomalous metallic ground state between the superconducting and insulating region. Although the high-temperature superconductivity, along with various other correlated phenomena, persists in the monolayer, for the first time, we discover the dimensional effect in cuprate superconductors: optimal transition temperature in monolayer Bi2201 is ~ 3 K lower than that of bulk samples. Our results establish monolayer Bi2201 as a new two-dimensional material with highly tunable high-temperature superconductivity and a minimal model system of cuprate superconductor.

About the speaker

张远波教授长期工作在低维材料介观输运与扫描探针研究领域，在低维狄拉克半金属、低维高迁移半导体、低维关联材料、低维磁性材料、低维本征磁性拓扑绝缘体、超薄高温超导体等领域都作出了突破性贡献。他在2000年毕业于北京大学，获物理学本科学位，2006年于美国哥伦比亚大学获得物理学博士学位，2006-2009年在加州大学伯克利分校任Miller Postdoc Fellow，2010年在IBM Almaden Research Center 进行博士后研究，于2011年在复旦大学任教授至今。

他的学术贡献受到广泛的认可，获得奖项和称号主要包括：哥伦比亚大学Charles Townes Fellowship (2005)；加州大学Miller Fellow (2006)；IUPAP Young Scientist Prize, International Union of Pure and Applied Physics (2010)；Nishina Asia Award, Nishina Memorial Foundation, Japan (2014)；国家JQ（2014）；教育部CJ 学者 (2017)；科学探索奖（2020）。