

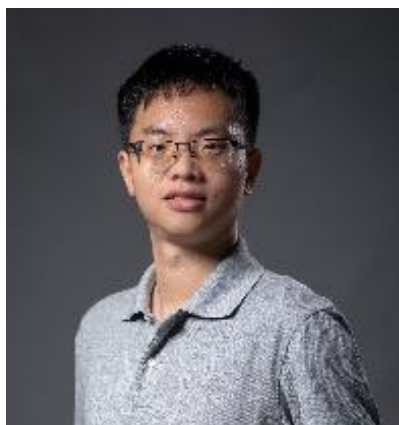


Weekly Seminar

Tunable topological flat band in rhombohedral multilayer graphene

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Time: 3:00 pm, Apr.30, 2025 (Wednesday)

时间: 2025年4月30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

Topological flat bands with non-trivial topology and flat band structure hold significant research interest in the field of condensed matter physics, serving as a promising platform for exploring novel quantum states such as unconventional superconductivity and quantum anomalous Hall effect. In rhombohedral multilayer graphene, the low-energy electronic bands exhibit layer-number-dependent exponential dispersion relations, characterized by pronounced flat band features and giant Berry curvature. However, the intrinsic rhombohedral multilayer graphene suffers from band overlap between its low-energy flat bands and high-energy dispersive bands, which constrains the full manifestation of its topological properties.

In this talk, I will introduce the construction of isolated flat Chern bands in rhombohedral multilayer graphene by introducing moiré superlattices. By this way, we observe emergent quantum phenomena including layer-polarized ferromagnetism, chirality-switchable Chern insulators, and high-Chern-number quantum anomalous Hall states. Particularly, in rhombohedral heptalayer graphene, strong electron correlations can spontaneously open topological gaps, leading to the formation of an "anomalous Hall crystal" phase. This discovery not only provides new insights into the coupling mechanisms between electronic correlations and topological order but also opens new avenues for tuning Chern insulators.

About the speaker

徐水钢博士, 现为西湖大学理学院特聘研究员, 独立课题组负责人。2009年本科毕业于武汉大学。2013年于香港科技大学物理系获得博士学位。博士毕业后留组从事博士后工作。2016年转入英国曼彻斯特大学凝聚态物理组开展博士后研究工作。2021年9月加入西湖大学物理系, 组建二维材料与量子输运实验室。徐水钢课题组长期从事二维材料的生长、量子输运特性研究及基于范德瓦尔斯异质结的器件研发。近期在二维材料的强关联效应、拓扑物态、非常规铁电等方面取得系列研究成果。相关成果以第一或通讯作者身份发表于 Science、Nature、Nat. Phys.、Phys. Rev. X、Phys. Rev. Lett.、Nat. Commun.等期刊。