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Searching for exotic quantum phases in low-dimensional vdW materials

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时间：11月02日（星期四）15:00—16:30
地点：北京大学物理楼中212大教室

报告人简介（About speaker）：张晨栋，2011年中国科学院物理研所毕业获博士学位，2011-2016年在美国得科萨斯大学奥斯汀分校从事博士后研究，2017年入职武汉大学物理科学与技术学院。研究兴趣集中在利用分子束外延-扫描隧道显微学联合的精细原子/电子结构表征手段，探索低维材料中的各种奇异量子物性（包括新奇能带结构、电子自旋、强关联物性等）。近年来在二维半导体异质结、基于范德华相互作用的关联物态调控等领域取得了一系列成果。已发表SCI论文40余篇，其中Nature/Science子刊8篇，Phys. Rev. Lett. 2篇， PNAS/ Adv. Mater /Nano Lett等多篇。现任湖北省物理学会秘书长，第六届中国青年科技工作者协会理事，Frontiers of Physics杂志副主编。

摘要（Abstract）: One of the key advantages of van der Waals materials is the great flexibility in materials engineering, giving rise to the unprecedented possibility of realizing multifarious quantum phases. This talk will be focused on two examples (in 1D and 2D, respectively) from our recent work in this aspect. The first one is the discovery of 1D single-unit-cell-width CrCl3 atomic wires. Such a 1D wire, consisting of a single row of face-sharing CrCl6 octahedra, was grown solely on an isotropic NbSe2 vdW surface. Scanning tunneling microscopy/spectroscopy and first-principles calculations jointly revealed that the single wire is a large-gap semiconductor exhibiting a Néel-type antiferromagnetic coupling. The underlying growth mechanism reveals the critical importance of the vdW interface interaction in controlling the dimensionality conversion. The second example reports a highly controllable and scalable conversion of a monolayer nonmagnetic semiconductor into a correlated magnet. Specifically, we revealed multiple kagome flat bands across the Fermi level in monolayer MoTe2-x by fabricating a uniformly ordered mirror-twin boundary superlattice (corresponding to a stoichiometry of MoTe56/33). The partial filling nature of flat bands yields a correlated insulating state with spontaneous magnetization.

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