

Layertronics in twisted 2D semiconductors

【摘要】

Twisted stacking and formation of moire superlattices have provided powerful approach towards designer quantum materials. In this talk, I will focus on the quantum geometric properties of electrons in twisted homobilayers of TMDs and graphene, arising from the layer quantum degree of freedom when twisting introduces layer pseudospin texture in real space and in momentum space. In small angle twisted TMDs, real-space Berry curvature from the moire-patterned layer pseudospin texture realizes an effective magnetic field, underlying the emergence of quantum anomalous Hall effect recently observed in twisted MoTe₂. The gate tunable ferromagnetic QAH at filling factor 1 further suggests the existence of an altermagnetic orbital Chern insulator at filling factor 2, where sizable orbital magnetization makes possible field initialization of the spin Neel order and Chern number, with the sign of Chern number electrically switchable at zero magnetic field. I will also discuss novel Hall effects of various band geometric origin in twisted homobilayers over broad range of twisting angles, including the time-reversal even linear Hall counter flow, and the nonlinear dynamical Hall effect of a crossed geometry.

【报告人简介】



Wang YAO obtained his BSc from Peking University in 2001, and PhD in physics from University of California, San Diego in 2006. He joined the University of Hong Kong in September 2008, and rose through the academic ranks to full Professor in 2017 and became Chair Professor of Physics in 2019. His group works in an interdisciplinary area across condensed matter physics, quantum physics, and optical physics, with current research interest lies in the physics of spin and pseudospin in two-dimensional quantum materials and their layered structures. He has received honours including the OCPA Achievement in Asia Award (Robert T. Poe Prize), Nishina Asia Award, XPlorer Prize, and has been named by Clarivate Analytics in the list of "Highly Cited Researchers" in consecutive years since 2018. He is also elected Fellow of American Physical Society and Fellow of Optica.

【报告人】

姚望
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【时间】

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【地点】

清华大学高等研究院
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