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# 报告

## 范德瓦尔斯异质结中的能谷电子学

## Valleytronics in Van der Waals Heterostructures

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### 讲者介绍 Biography

Prof. Yao got his BSc in 2001 from Peking University, and PhD in 2006 from the University of California, San Diego. After two years of postdoc at University of Texas, Austin, he joined the University of Hong Kong in 2008, and is currently Professor of Physics there. The recent focus of his research is on novel quantum phenomena associated with spin and pseudospins in 2D materials and their van der Waals heterostructures. He received the Croucher Innovation Award in 2013, and the Achievement in Asia Award in 2014 by the International Organization of Chinese Physicists and Astronomers.

### 报告摘要 Abstract

In semiconducting transition metal dichalcogenides monolayers, the band edge carriers are described by massive Dirac cones, located at K and -K corners (valleys) of the Brillouin zone. The valley dependent properties of these massive Dirac fermions have enabled versatile control of the valley pseudospin in monolayers. Van der Waals stacking of the 2D semiconductors into vertical heterostructures is a powerful approach towards designer quantum materials that can combine and extend the exotic properties of the building blocks. Ubiquitous to these vdW heterostructures is the formation of moiré pattern due to the inevitable lattice mismatch. We show that, uniquely for the valley massive Dirac fermions, the moiré offers unprecedented opportunities for nanoscale patterning of electronic, optical, and topological properties. We give examples including: (i) moiré patterned exciton properties, for programmable arrays of quantum emitters and spin-orbit coupled excitonic superlattices; (ii) electrically tuned topological band inversion for moiré defined lateral superstructures of topological insulators.

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