北京大学量子材料科学中心

International Center for Quantum Materials, PKU

ICQM Informal Seminar

Topological insulator gap in graphene with heavy adatoms

Ruqian Wu
Department of Physics and Astronomy, University of California, Irvine, California

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Venue: Room 607, Conference Room A , Science Building 5
地点：理科五号楼607会议室

Abstract

Graphene was the first material predicted to realize a topological insulator (TI) in seminal work by Kane and Mele, though unfortunately the gap is unobservably small due to carbon's exceedingly weak spin-orbit coupling. It is hence important to search appropriate adatoms and/or substrates to expand the spin-orbit coupling gap through hybridization. We found that heavy In or Tl adatoms may dramatically enhance the gap to detectable values of order 0.01 eV. We also introduce a new framework for engineering a 2D spin-orbit coupling gap with impurity bands arising from heavy adatoms through graphene, in particular osmium and iridium. First principles calculations predict that the gaps generated by this means exceed 0.2 eV over a broad range of adatom coverage; moreover, tuning of the Fermi level is not required to enter the TI state. The mechanism at work is expected to be rather general and may open the door to designing new TI phases in many materials.

About the Speaker

Dr. Ruqian Wu received his Ph.D. in the Institute of Physics, Chinese Academy of Sciences in 1989. Dr. Wu is a professor in the Department of Physics of the University of California, Irvine. Prof. Wu's expertise is in the first principles calculations of condensed matter systems, including ferromagnetic metals and semiconductors, surfaces, and so on. He is an author of 185-plus referred journal articles and has written 11 invited book chapters. Prof. Wu is a fellow of the American Physical Society and a recipient of the Outstanding Overseas Chinese Young Scientist Award.