Topological transitions and Quantized Signatures of Chiral Majorana Fermions

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The recent discovery of topological insulator (TI) has led to the recognition of the importance of topology phase in condensed matters. I will discuss the topological transitions of Dirac fermions for TI, e.g., $(BiSb)_2Te_3$. Among them are dissipationless transport in quantum anomalous Hall (QAH) and the control and switching of the topological order. When TI is interfaced with an antiferromagnetic (AFM) layer, it provides a new platform for studying the interface physics, e.g., topological phase. New physics may also emerge. The growth of TI/AFM by MBE will be described. Magnetic doped TI/AFM heterostructures are shown to give rise to a marked increase in exchange bias and a factor of three enhancement in the magnetic order of Magnetic doped TI is also demonstrated. In addition, the topological phases at the interfaces at the TI/AFM heterostructure can be controlled. When the QAH edge states interface with a superconductor, the Dirac space is transformed to the Nambu space for hosting Majorana fermions via pairing energy. We will discuss the topological orders of this topological superconductor transformation and experimentally show the firm evidence of transport measurements to ascertain the one-dimensional chiral Majorana fermion. A series of topological phase transitions are controlled by the reversal of the magnetization, where the half-integer quantized conductance plateau (0.5 e^2/h) is observed as a firm signature of the Majorana fermion.

The work was in part supported by ARO-MURI and DoE EFRC Shines.

A short biography:

Dr. Kang L. Wang is currently Distinguished Professor and the Raytheon Chair Professor in Physical Science and Electronics in the University of California, Los Angeles (UCLA). He is affiliated with the Departments of ECE, MSE and Physics. He received his BS degree from National Cheng Kung University (Taiwan) and his MS and PhD degrees from the Massachusetts Institute of Technology. He is a Member of Academia Sinica, Fellow of the IEEE, and a member of the American Physical Society. He was a Guggenheim Fellow. He also served as Editor-in-Chief of IEEE TNANO, editor of Artech House, Consulting Editor for Spins, and Associate Editor for Science Advances. His research areas include nanoscale physics and materials; molecular beam epitaxy; topological insulators; spintronics and low dissipation devices; neurodynamics and neurotronics.

*The work was in part supported by NSF, ERFC-SHINES, FAME, C-Spin, CEGN and NSF