CSU PHYSICS COLLOQUIUM

"Topological Insulator/Magnetic Insulator Heterostructures"

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Monday Sept. 9th at 4:00pm

120 Engineering (Hammond Auditorium)

Abstract

Recent years have witnessed a rapidly growing interest in topological insulators, not only because of rich intriguing physics in such materials, but also due to their promising potential in quantum computing and spintronics applications. This presentation will discuss layered structures where a topological insulator interfaces with a magnetic insulator. This system is of particular interest for three main reasons: (1) one can use a magnetic insulator to pump spins into a topological insulator; by measuring the resultant responses in the topological insulator, one can reveal the nature of the topological surface states; (2) the system allows us to explore how to take advantage of the topological surface states to manipulate magnetism; (3) it enables the realization of new quantum states.

This presentation consists of three parts. Part I will discuss experiments on spin pumping from a magnetic insulator $Y_3Fe_5O_{12}$ slab to a topological Kondo insulator SmB_6 thin film; the experiments advanced the understanding of the topological surface states in SmB_6. Parts II and III will report on how to use the topological surface states in a topological insulator to manipulate magnetism in a neighboring magnetic insulator. Part II will discuss how the topological surface states in a topological insulator Bi_2Se_3 thin film modify the magnetic ordering in a neighboring $Y_3Fe_5O_{12}$ thin film, while Part III will be on the use of the topological surface states in a Bi_2Se_3 thin film to induce magnetization switching in a neighboring a magnetic insulator $BaFe_{12}O_{19}$ thin film.

Biography

Mingzhong Wu received his Ph.D. in Solid State Electronics from Huazhong University of Science and Technology in China in 1999, joined the faculty of Colorado State University (CSU) in the USA in 2007, and is currently the Professor of Physics and the Director of CSU's "Program of Research and Scholarly Excellence" Designated Center for Advanced Magnetics. He is interested in many research topics in magnetism and magnetic materials; his current research areas include magnetization dynamics, nonlinear spin waves, spintronics, and topological materials. He has authored over 140 technical papers and 4 book chapters; he has also co-edited a book on magnetic insulators. He served as an Editor for IEEE Magnetics Letters (2012- 2016), and he is currently serving as an Editor for Physics Letters A. He is on the Editorial Advisory Board for the Journal of Applied Physics (2016-2021) and the Editorial Board of Journal of Magnetism and Magnetic Materials (2018-2020). He served as the Education Committee Chair (2012-2015) and the Finance Chair (2015-2018) of the IEEE Magnetics Society, and he currently serves as the Technical Committee Chair of the Society. He received the Professor Laureate award from the College of Natural Sciences at CSU in 2019.