



CSU PHYSICS COLLOQUIUM

Chalcogenide Compounds as Emerging Semiconducting Materials

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4:00 PM Monday, October 9, 2017

Refreshments at 3:45 PM

Location: 120 Engineering (Hammond Auditorium)

Abstract

Recent topics of interest in condensed matter physics, ranging from topological materials, iron-based superconductors to two-dimensional semiconductors, share one common trait: they often involve chalcogenide compounds. In this talk, I will discuss two material systems: 2D transition-metal dichalcogenides (TMDCs) and chalcogenide perovskites.

A monolayer TMDC with broken inversion symmetry possesses two degenerate valleys that can be selectively excited by circularly polarized light. The valley degeneracy can be broken by an external magnetic field, leading to valley Zeeman splitting. We demonstrate that the valley splitting can be enhanced by more than an order of magnitude, by exploiting the interfacial exchange field from a ferromagnetic substrate. This approach opens up new possibility for valley control for valleytronics applications.

The rapid progress in halide perovskites for photovoltaics has inspired us to search for novel semiconductor materials that can inherit the excellent optoelectronic properties of halides, while avoiding their toxicity and instability problems. I will present results on the synthesis and characterization of chalcogenide perovskites-an emerging class of ionic semiconductors. These earth abundant, stable inorganic materials with tunable band gap and strong light absorption are promising candidates for solar absorbers and optoelectronic applications.

Biographical Sketch

Hao Zeng received his B.S. degree from Nanjing University and Ph.D. from University of Nebraska-Lincoln, both in physics. He was a postdoc fellow at IBM Thomas J Watson Research Center between 2001 and 2004. At IBM, he worked on magnetic nanocomposites for advanced magnets, and magnetic tunnel junction bio-sensors. He joined the Physics Department at the University at Buffalo, the State University of New York as an Assistant Professor in 2004. In 2014 he was promoted to full Professor. He is the recipient of an IBM Research Division Award, National Science Foundation CAREER award, UB Exceptional Scholar-Yong Investigator Award and Lixun Young Scientist Award, Institute of Metal Research, CAS. He is an editor of Journal of Magnetism and Magnetic materials and an editorial board member of Chinese Physics B. He has published 100+ papers in Journals including Nature, Nature Nanotechnology, Physical Review Letters, Nano Letters, Journal of the American Chemical Society and Advanced Materials. These papers have been cited for 13,000+ times. Hao Zeng's research area is in condensed matter and materials physics. His present research interests focus on nanoscale magnetism and spintronics, materials for energy applications and biomagnetics.