Joint ECE Department and Quantum Materials Center Seminar

Composite Molecular Multiferroics for Sensors and Energy-Efficient Memory

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Abstract

Magnetoelectric effects are emerging properties based on the coupling between structure, charge, and magnetism of materials. Searching for microscopic magnetoelectric coupling mechanisms has been a trending research topic for the potential application in sensors, actuators, and energy-efficient information storage and processing. Recent advancement of ferroelectricity and magnetism in molecular crystals suggests promising magnetoelectric coupling in the molecular crystal composites. Besides the inherent flexibility, scalability, and sustainability of molecular crystals, the molecular ferroelectrics features low switching field, strong piezoelectric response, and high transition temperature. The molecular crystals of organometallic compounds exhibit delicate interplay between structure, charge, and spin, which causes the spin crossover effect, as a promising mechanism for magnetoelectric coupling. In this talk, I will discuss our recent work on molecular ferroelectrics, spin crossover complexes, and the interfaces between the magnetic and electric molecular crystals to realize the voltage-control of magnetism in a reversible and non-volatile fashion.

Bio

Dr. Xiaoshan Xu has obtained his Ph.D. degree from Georgia Institute of Technology in Physics with minors in Computer Science and his B.A. and M.S. degrees from Nanjing University in Physics. He has worked as a postdoctoral research associate in the University of Tennessee and a staff member in the Oak Ridge National Lab. He is a recipient of the Eugene Wigner Fellowship in the Oak Ridge National Lab, Faculty Early Career Development Award from the National Science Foundation, and the Early Career Award from the Department of Energy. Dr. Xu has joined University of Nebraska-Lincoln since 2013 as an assistant professor in the Department of Physics and Astronomy and a faculty associate in Nebraska Center for Materials and Nanoscience. He is also an adjunction faculty member in the Department of Mechanical and Materials Engineering since 2018.