View this email in your browser

UC DAVIS MATERIALS SCIENCE AND ENGINEERING

Weekly Seminar Series With:

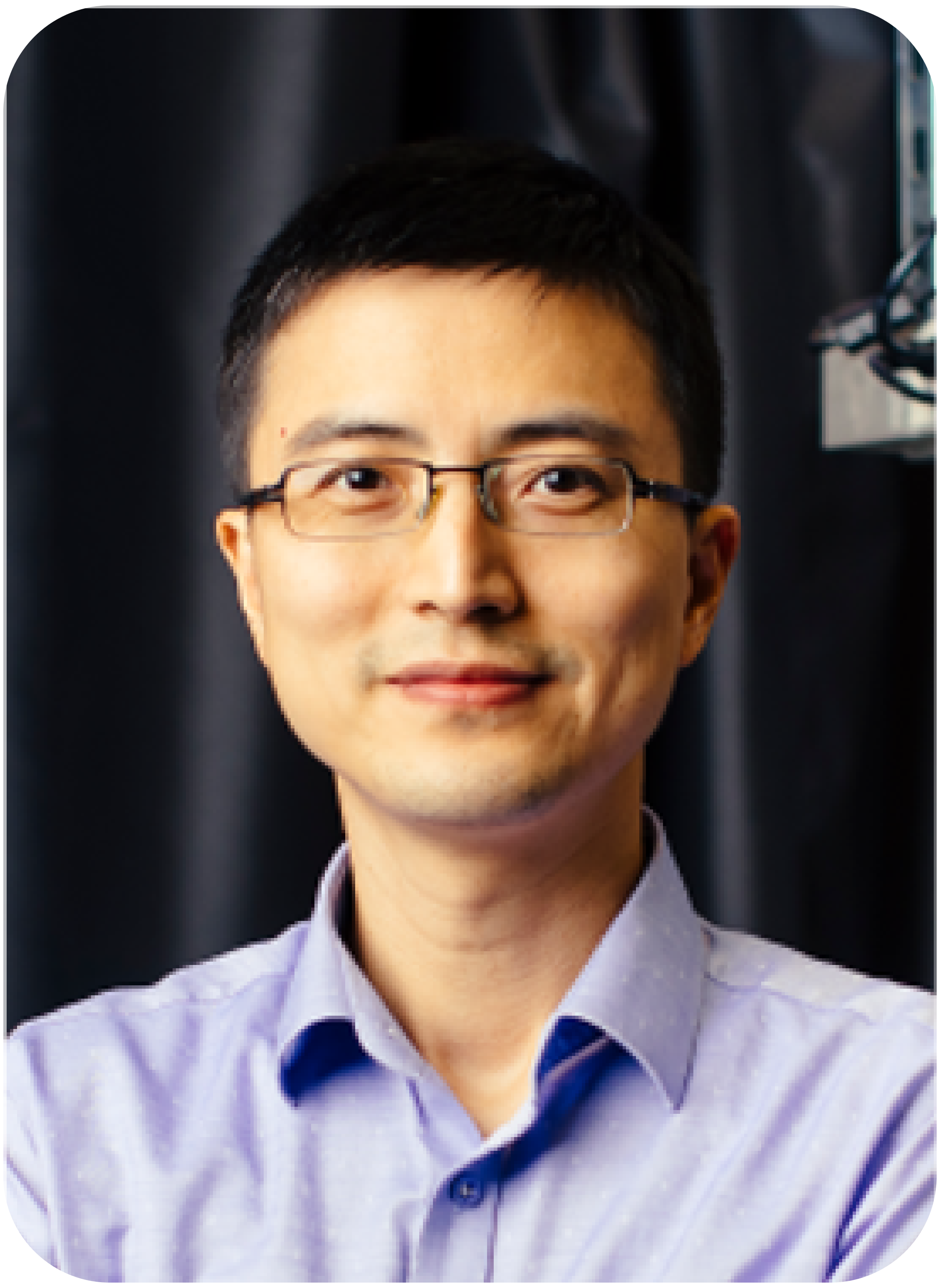
Dr. Jie Yao

University of California Berkeley

Tuesday, May 27th 2025

1062 Bainer Hall

12:10PM - 1:00PM



Prof. Jie Yao obtained his PhD from the University of California, Berkeley in 2010 and conducted postdoctoral research at Stanford University after that. He joined the Department of Materials Science and Engineering at UC Berkeley as an assistant professor in 2013. His research interests are mainly focused on optical materials and nanophotonics, including metamaterials, plasmonics and photonic crystals. He is also developing novel 2D materials with ferroic responses for electronic and spintronic applications. Prof. Yao has won the CAREER award from the National Science Foundation and Early Career award from SPIE, the International Society of Optics and Photonics. He is also a Heising-Simons Faculty Fellow and a recipient of the Hellman Fellowship from the Hellman Foundation.

Manipulating Ferroic Responses in 2D Materials

Layered van der Waals materials have enabled novel electrical, optical and mechanical properties that are not observable in conventional 3-dimensional materials. 2D ferroic (ferromagnetic, ferroelectric) materials are bringing us new opportunities in controlling material response to external stimuli and enabling novel device applications such as memories.

We use the MX (M= Sn, Ge; X=S, Se) material family to demonstrate a 2D ferroelectric platform with four ground states. We realized AA stacking of 2D SnSe layers, which preserves the broken inversion symmetry of the crystal structure, thus its ferroelectricity. The co-existence of in-plane and out-of-plane polarizations in different thicknesses of SnSe sheets is observed. More importantly, the switching voltage of the SnSe sheets scales down with the thickness and approaches sub-0.3V regime, offering great potential for low-power device applications.

Besides the ferroelectrics, we also developed a novel approach to achieve diluted magnetic oxides at the 2D limit. By intercalating zinc ions into the van der Waals gaps between graphene oxide template layers, we created monolayers and bilayers of ZnO in the van der Waals phase. It also allows us to introduce magnetic dopants in ZnO sheets, such as Co atoms, enabling a novel ferromagnetic phase at room temperature. Such materials offer novel opportunities for spintronic and memory device applications.

Disclaimer: Seminars May Be Recorded For Academic Purposes Only

UCDAVIS MATERIALS SCIENCE AND ENGINEERING

Our mailing address is:
One Shields Ave Ghausi Hall
Davis, CA 95616