# Materials Chemistry Seminar

## Friday, January 19, 2024
## 11:30 a.m. ~ BRWN 4102

***"Room-Temperature Switchable Rashba/ Dresselhaus Effect in a Ferroelectric Quantum Well"***


## Professor Jian Shi

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Dr. Jian Shi is a Professor in the Department of Materials Science and Engineering, and Department of Physics at Rensselaer Polytechnic Institute. Dr. Shi was a postdoctoral research fellow at Harvard University from 2013 to 2014. Dr. Shi received his Ph.D. degree in Materials Science at the University of Wisconsin at Madison in 2012 advised by Prof. Xudong Wang. He is a recipient of the AFSOR Young Investigator program award in 2018, a recipient of IEEE Ferroelectrics Young Investigator Award in 2023 and a recipient of the Simons Foundation Pivot Fellowship in 2023. He is also an associate editor of Journal of Applied Physics. His current research foci are: polar, spintronic, chiral and Berry parameters-tunable materials for computing and energy.


## Abstract:

Quantum well structures lacking inversion symmetry host a plethora of exciting physical phenomena. In this talk, we show the design, creation, and electron-spin-lattice interactions of quantum well polar materials for spintronics and energy transduction. First, we show the role of dimensionality on the phonon and polarization dynamics of free-standing inorganic two-dimensional membranes [1]. Then, we show the discovery of the persistent spin helix in a hybrid ferroelectric perovskite with a natural quantum well structure [2]. We demonstrate that the spin-polarized band structure is switchable at room temperature via an intrinsic ferroelectric field. The favoured short spin helix wavelength (three orders of magnitude shorter than in III–V materials), room-temperature operation and non-volatility make the hybrid perovskite an ideal platform for understanding symmetry-tuned spin dynamics, towards designing practical spintronic materials and devices that can resolve the control-dephasing dilemma.


Reference Articles:


https://www.nature.com/articles/s41586-022-04850-7.pdf

https://www.nature.com/articles/s41566-022-01016-9.pdf


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