15 Dec **Wednesday** **12:45 – 1:30** **Chair: GONG Jiangbin (龚江滨)**

Extreme Strain Tunability and Novel Phases in Ferroelectric Oxide Membranes

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Professor NIE Yuefeng is a professor in the department of Materials Science and Engineering (MSE) at Nanjing University. He received his B.S. and M.S. degrees in Physics from Sun Yat-sen University, and his Ph.D. degree in Physics from the University of Connecticut in 2011. After spending about 4 years as a post-doc in Cornell Center for Materials Research (CCMR) at Cornell University, he joined the faculty in MSE at Nanjing University in late 2014. His research focuses on the discovery and engineering of emergent quantum phases in transition metal oxide thin films by oxide molecular-beam epitaxy (MBE). He has published over 50 papers in high-impact journals, including Nature, Phys. Rev. Lett. and Nat. Commun. Recently, he and his group made many contributions to the advances of atomic-scale precise thin film growth and synthesized ultrathin freestanding perovskite oxide membranes down to the ultrathin limit, providing new opportunities in the exploration of novel low dimensional phases in perovskite oxides.

Abstract:

The recent advances in the synthesis of high-quality freestanding oxide membranes provide great opportunities for the exploration of novel phases and properties in transition meatal oxides. Here, we report the extreme strain tunability and intriguing phenomena observed in ferroelectric oxide membranes[1-4]. In prototype ferroelectric $PbTiO_3$, we realized a giant uniaxial strain up to 6.4%, a value far beyond typical maximum epitaxial strain, leading to a strain-driven 90° ferroelectric polarization rotation[2]. In uniaxially-strained $SrTiO_3$, we achieved pure in-plane ferroelectric phases and explored the dimensionality effects in the ultra-thin limit. Our results revealed that prominent size effects still exist in ferroelectric thin films even without a depolarization field[3]. Also, we observed a giant tuning of the interfacial thermal conductance at the metal/ferroelectric interface by applying uniaxial strain to switch the polarization orientations in the ferroelectric layer, providing a new route to optimize the heat dissipation in nano-electronics[4]. These works highlight the extreme strain tunability and rich phases in oxide membranes.

References

[1] D.X. Ji, *et al.*, ***Nature*** 570, 87 (2019)
[2] H. Lu, *et al.*, ***Adv. Mater. Interfaces*** 1901604 (2020)
[2] H.Y. Sun, *et al.*, *in preparation* (2021)
[4] Y.P. Zang, *et al.*, ***Adv. Mater.*** 202105778 (2021)