北京大学量子材料科学中心

International Center for Quantum Materials, PKU

Special Seminar

Building Nanoscale Oxide Thin Films and Interfaces One Atomic Layer at a Time

Xiaoxing Xi

Temple University

Time: 4:00pm, June 27, 2016 (Monday)

时间：2016年6月27日 （周一）下午4:00

Venue: Room M212, Physics building, Peking University

地点：北京大学物理楼，中楼212教室

Abstract

Advancements in nanoscale engineering of oxide interfaces and heterostructures have led to discoveries of emergent phenomena and new artificial materials. Combining the strengths of reactive molecular-beam epitaxy and pulsed-laser deposition, we show that atomic layer-by-layer laser molecular-beam epitaxy significantly advances the state of the art in constructing oxide materials with atomic layer precision. Using $Sr_{1+x}Ti_{1-x}O_3$ and Ruddlesden–Popper phase $La_{n+1}Ni_nO_{3n+1}$ (n = 4) as examples, we demonstrate the effectiveness of the technique in producing oxide films with stoichiometric and crystalline perfection. By growing $LaAl_{1+y}O_3$ films of different stoichiometry on TiO_2-terminated $SrTiO_3$ substrate at high oxygen pressure, we show that the behavior of the two-dimensional electron gas at the $LaAlO_3/SrTiO_3$ interface can be quantitatively explained by the polar catastrophe mechanism. In $LaNiO_3$ films on $LaAlO_3$ substrate with $LaAlO_3$ buffer layer, we observed the metal insulator transition in 1.5 unit cells, which is driven by oxygen vacancies in addition to epitaxial strain and reduced dimensionality.

About the speaker

Xiaoxing Xi is the Laura H. Carnell Professor of Physics at Temple University. Prior to joining Temple in 2009, he was a Professor of Physics and Materials Science and Engineering at the Pennsylvania State University. He received his PhD degree in physics from Peking University and Institute of Physics, Chinese Academy of Science, in 1987. After several years of research at the Karlsruhe Nuclear Research Center, Germany, Bell Communication Research/Rutgers University, and University of Maryland, he joined the Physics faculty at Penn State in 1995. He is a Fellow of the American Physical Society, and was a recipient of the NSF CAREER Award and a Chang Jiang Scholar at Tsinghua University, China. He was Interim Chair of the Department of Physics at Temple University from 2014 to 2016. His research focuses on the materials physics underlying the applications of oxide, boride, and 2-dimensional dichalcogenide thin films, in particular epitaxial thin films and heterostructures at the nanoscale. He has published over 300 papers in refereed journals and holds three patents in the area of thin films of high-T_c superconductors and magnesium diboride.