Seminar

Oxide interfaces and heterostructures: Physics, characterization, and synthesis

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Time: 4:00pm, July.25, 2013 (Thursday)
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Venue: Room 607, Science Building 5
地点：理科五号楼607会议室

Abstract

At the $LaAlO_3/SrTiO_3$ interface, a charge transfer of $e/2$ from the LaO^+ plane to the TiO_2 plane is expected to generate an areal carrier density of ~ $3x10^{14}/cm^2$. Taking into account the strong buckling of the LaO and AlO_2 layers, a dependence of the carrier density on the $LaAlO_3$ thickness has been predicted: the carrier density becomes non-zero above 4 unit cells and gradually increases with thickness to the value of ~ $3x10^{14}/cm^2$. We show that under a unique set of growth conditions of the $LaAlO_3$ layer by laser MBE, the experimental result agrees with the theoretical prediction quantitatively. The stoichiometry in the $LaAlO_3$ films is believed to play an important role. Exceptional stoichiometry control as well as fabrication of artificial layered oxide heterostructures may be achieved by atomic layer-by-layer growth using Laser MBE from separate oxide targets. Results from the growth of $SrTiO_3$ and $LaAlO_3$ films using this approach will be presented.

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. His research focuses on the materials physics underlying the applications of oxide and boride thin films, in particular epitaxial thin films and heterostructures at the nanoscale. Using various deposition techniques including Laser Molecular Beam Epitaxy and Hybrid Physical-Chemical Vapor Deposition, his group is currently working on the atomic layer-by-layer growth of artificial oxide heterostructures and epitaxial magnesium diboride thin films for electronic and radio frequency cavity applications. He has published over 300 papers in refereed journals, book chapters, and conference proceedings, and holds three patents in the area of thin films of high-T_c superconductors and magnesium diboride.