College of Science
Department of Physics & Astronomy

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Weekly Calendar

April 11 – April 16, 2016

Special Seminar

"Explore & Control Complex Oxide Interfaces with Atomic Precision"

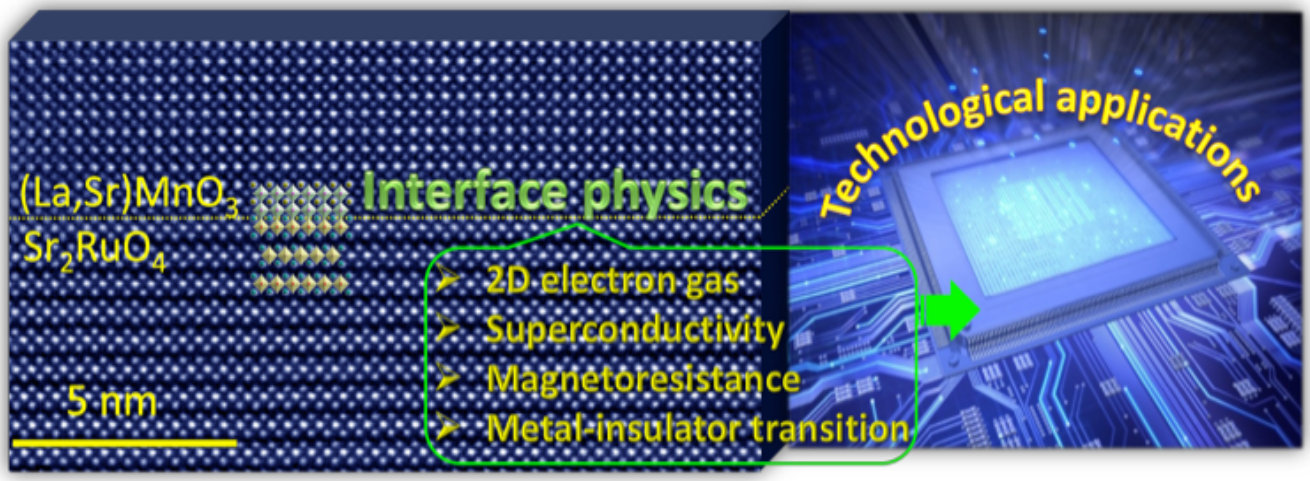
3:30 PM Tuesday, April 12, 2016

109 Nicholson Hall

Hangwen Guo
LSU
Host: Jiandi Zhang

• Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall •

Complex oxides offer rich playground to discover emergent phenomena and achieve new functionality due to the coupling of electron, spin, lattice and orbital degrees of freedoms. Oxide thin films, especially, exhibit unique behaviors driven by spatial confinement and broken symmetry at the interface. In order to understand the complexity, one needs to understand the origin of the competing interactions at both macroscopic and microscopic level. In this talk, I will describe our ability to grow high quality thin films with atomically sharp interfaces, and characterize their properties at the atomic level. I will present several examples to show that such combination of growth and characterization techniques not only allows us to determine the origin of interface properties, but expands our ability to explore unconventional interfaces and search for novel functionality.



Epitaxial growth of oxide film on unconventional substrate with atomically sharp interface.

Hearne Eminent Lecture Series

"Quantum Machine Learning-How Quantum Computers can Learn Patterns Classical Computers can't"

3:30 PM Thursday, April 14, 2016

109 Nicholson Hall

Seth Lloyd
MIT
Host: Mark Wilde

• Refreshments served at 3:10 PM in 232 (Library) Nicholson Hall •

Hearne Eminent Public Lecture

“Quantum Life - How Biological Systems Use Quantum Mechanics”

5:00 PM Friday, April 15, 2016

130 Nicholson Hall

Seth Lloyd
MIT

Recent experimental evidence suggests that living organisms are using quantum mechanics in a sophisticated fashion to enhance the efficiency of photosynthesis. Bacteria are essentially performing a quantum computation to extract energy from light.

Dr. Lloyd will show how plants and bacteria perform quantum information processing, and will discuss how living creatures engage in all sorts of quantum activities in their efforts to survive and reproduce.

Landolt Astronomical Observatory Public Observing Night

April 16, 8:30-9:30 PM. Public Observing on the Roof of Nicholson Hall
"Jupiter near gibbous Moon"

LSU College of Science Department of Physics & Astronomy

SATURDAY SCIENCE

AT LOUISIANA STATE UNIVERSITY

Using Space Robots to do Science in Antarctica

A public lecture by

Dr. Peter Doran

LSU Department of
Geology and Geophysics

16 April 2016, 10-11:00 a.m.

Room 130 Nicholson Hall, LSU

LSUSaturdayScience@gmail.com

NanoDays

2-6 p.m.

Saturday, April 16
Highland Road Park Observatory

The observatory will have this month's solar viewing session from 2:30-4:30 p.m. through HPO's Coronado Solar Max II.

Lunar viewing will take place from 4:30 - 6:30 p.m. showing a magnified daytime moon.

Small Science Wields *BIG IDEAS*

NanoDays 2016

Join LSU for the 7th annual NanoDays at the Highland Road Park Observatory on Saturday, April 16, from 2-6 p.m. The free family-friendly event is open to the public and will feature several hands-on activities for guests of all ages:

- Learn first-hand how a Scanning Probe Microscope helps scientists explore the nanoworld
- See how nanomaterials are used to make stain-free clothes
- Play with liquid crystals and magnets
- Make an Oobleck, a liquid with both liquid and solid properties
- At 4 p.m., get inside the mind of physicist Shane Stadler, a professor in the LSU Department of Physics & Astronomy, who will present **"Magnetic Refrigeration: "The New Cool"**

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SEMINAR SERIES 2016

Monday, April 18
3:00pm
1008B Digital Media Center
Louisiana State University

Dispersion Morphology of Nafion in the Fabrication of Fuel Cell Membrane Electrode Assemblies: Relationships to Electrolytic Fuel Call Durability and Performance

Modern polymer electrolyte fuel cells (PEFCs) require technologies that generate higher performance, durability and component structural integrity. The membrane electrode assemblies (MEAs) of PEFCs typically contain a Pt/carbon black catalyst and an ionomer, such as Nafion. In one process MEAs are produced by solution casting from a dilute solvent dispersion of these components. We consider current hypotheses relating fuel cell durability and MEA toughness to changes in these components with multiple fuel cell voltage potential cycling: namely, that fuel cell durability is associated with the loss of electrochemical (Pt) surface area (ECSA) and that MEA mechanical properties are due to ionomer crystallinity. We weigh these hypotheses against an alternative that both fuel cell durability and MEA toughness are the result of dispersion particle morphology and its evolution during the course of drying to the MEA film. Small-angle neutron scattering (SANS) using the Lujan Center instrument, LQD, was used to show that different solvents determine the dispersion particle structure due to the amphiphilic nature of Nafion and that the morphology of the dispersion in different solvents follow different evolutionary paths on drying. The SANS results suggested that the ability of the dispersion particles to form an entangled network leading to a homogeneous, reversible gel alone was the determining factor for mechanical toughness of the MEA and fuel cell durability. It was found that neither toughness correlated with Nafion crystallinity nor was durability correlated with changes in the ECSA with voltage cycling. These results show the power of SANS as a characterization technique, when used along with other characterization methods and property and performance metrics, to address complex issues in materials science process, structure, properties and performance characteristics. Our work lends support to the hypothesis that MEA durability and toughness are affected by the dispersion morphology and are likely associated with the ability of Nafion to chain entangle.

Guest Speaker

Dr. Rex Hjelm

Instrument Scientist

Los Alamos Neutron Science Center, Los Alamos National Laboratory

Free and open to the public

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