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NEBRASKA CENTER FOR MATERIALS AND NANOSCIENCE
2013 SEMINAR SERIES PRESENTS

NCMN

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Oxide Nanoelectronics

Oxide materials are the most abundant compound in the earth's crust and possess a wide range of electrical, optical, and magnetic properties. For instance, insulators, high quality metals, dielectrics, ferroelectrics, piezoelectrics, semiconductors, ferromagnetics, transparent conductors, superconductors, and nonlinear optic materials have all been produced using oxide materials. Oxide materials have enormous potential, particularly as the fundamental building block of a new generation of electronic devices. We create these materials by artificially layering various atoms including oxygen at the single atomic level and discovering novel properties that are likely to find applications in electronic, magnetic, optical and electromechanical devices. I will discuss how our research [1-6] played a role in understanding the fundamental solid state phenomena at the atomic scale and the discovery of new materials so that we can use them to develop new oxide nanoelectronic devices. Atomic layer control of novel oxide heterointerfaces may provide some of the answers that we need to continue the electronics revolution, particularly for nanoscale devices with new functionality that are currently being developed and can be applied to various fields.

1. "Mechanical Writing of Ferroelectric Polarization" *Science*, **336,** 59 (2012)
2. "Giant piezoelectricity on Si for hyper-active MEMS" *Science*, **334,** 958 (2011)
3. "Metallic and insulating oxide interfaces controlled by electronic correlations" *Science*, **331**, 886 (2011)
4. "Sketched oxide single-electron transistor" *Nature Nanotechnology*, **6**, 343 (2011)
5. "Creation of a two-dimensional electron gas at an oxide interface grown on silicon" *Nature Communications*, **1**, 94 (2010)
6. "Ferroelastic switching for nanoscale nonvolatile magnetoelectric devices" *Nature Materials*, **9**, 309 (2010)

Monday, February 4, 3:30 pm
Room 136 Jorgensen Hall

Refreshments at 3:15 pm in Jorgensen Atrium area

Host:
Prof. Evgeny Tsymbal
Department of
Physics & Astronomy

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