

**PHYSICS & ASTRONOMY COLLOQUIUM  
UNIVERSITY OF WISCONSIN – STEVENS POINT**

**FRIDAY, DEC 6, 2013  
2:00 PM Room A106 SCI**

**Seth King**

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**Engineering a Contradiction: Developing Transparent  
Conducting Oxide Materials**



Dr. Seth King is an Assistant Professor of Physics at the University of Wisconsin – La Crosse. He is a 2009 graduate of UW – Milwaukee where he earned his Ph.D. in physics specializing in materials and surface science, and a 2003 physics graduate of UW – Eau Claire. Dr. King’s research focuses on the growth and characterization of wide-bandgap semiconductors including zinc oxide, magnesium oxide, and gallium nitride based materials. In particular, Dr. King is interested in understanding the role hydrogen plays in doping and stabilizing polar oxides, as well as developing new oxide materials for applications in photovoltaic, photocatalytic, and optoelectronic devices.

**ABSTRACT:** Transparent conducting oxides (TCO) have become a ubiquitous part of our everyday lives as these materials are employed in everything from flat panel displays and touch screens to photovoltaic and optoelectronic devices. However, being both transparent and electrically conductive are properties which appear to be in direct opposition to what we observe in the everyday world. Currently, only a handful of materials exhibit the unique properties of being both optically transparent and electrically conductive with those employed on an industrial scale usually containing large amounts of indium (In), an element as abundant in the Earth’s crust as silver and costing about the same. To lower inherent material costs, non-In based TCO materials must be developed. However, the requirement that a material be both highly conducting and optically transparent requires that the fundamental physics and chemistry of the TCO candidate material be carefully engineered. An excellent candidate to replace In-based TCOs is zinc oxide (ZnO) and its alloys. Unlike In, Zn is cheap and abundant with a stable supply. Furthermore, ZnO may be readily fabricated using standard industrial techniques. In this colloquium we will address the general need for TCOs in the current generation of electronic devices, discuss how material properties are engineered and measured, and present the results of current work to develop inexpensive ZnO based nanolaminates for TCO applications.

*Faculty, staff and students are cordially invited to attend.  
Refreshments will be served beginning at 1:45 pm*