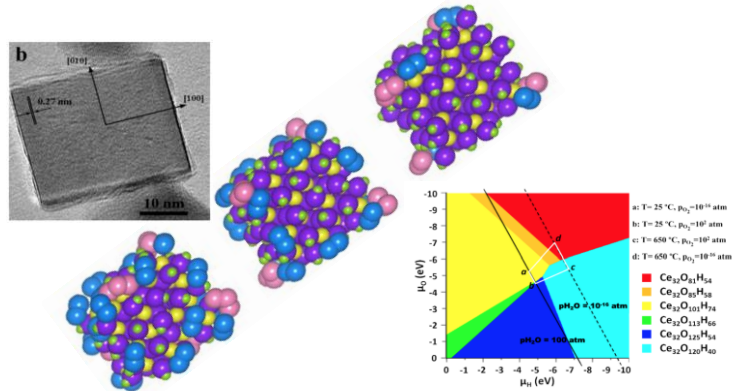




**Metal oxide nanoparticles in “real” environments:
Starting out simple with Ceria Nanoparticles**

Prof. Matthew Beck

Chemical & Materials Engineering
University of Kentucky



**Materials
Engineering
Fall 2014
Seminar Series**

**Monday, Sept 29th
3:30 pm Coffee
3:45 pm Seminar
ARMS 1010**

Metal oxide nanoparticles (MONPs) with sizes on the order of 10 nm are exceptionally active reduction/oxidation catalysts and are widely applied as polishing agents, fuel cell electrolytes, and in catalytic converters in car exhaust systems. Recently, MONPs have been used as pollution-fighting and efficiency-enhancing diesel fuel additives, and have been reported to exhibit potential therapeutic effects as anti-oxidants with a range of possible biomedical applications. But the same chemical activity and ease of distribution that is generating excitement for potentially “game-changing” applications of MONPs also raises important questions about the health and safety of MONPs. The emerging transition to applications involving the wide release of MONPs into the environment or the human body demands a transformational increase in our understanding and control of how MONPs interact with and, ultimately, support or damage environmental and biological systems. Here I discuss our recent work examining ceria nanoparticles (CNPs) as model MONPs, and examine the effects on CNPs of exposure to the simplest of biological environments: one containing oxygen and water. We show important consequences of environmental conditions on the CNP surface structure, and highlight how these changes can dramatically alter our perspectives on catalysis by such nanoparticles.

Prof. Beck joined the Department of Chemical & Materials Engineering at the University of Kentucky in July 2009. He has undergraduate and graduate degrees in Materials Science & Engineering from the University of Michigan and Northwestern University, respectively. He was a post-doc and later a Research Assistant Professor in the Physics Department at Vanderbilt University before coming to UK. The Computational Materials research group @ UK draws members from diverse backgrounds and sustains collaborations with researchers in Physics, Electrical Engineering, Materials Science, and Chemical Engineering, from both industry and Academia.