

# MATTHEW J. BECK

## Professional Preparation

University of Michigan	Ann Arbor, MI	Materials Science & Engineering	B. S. E., 2000
Northwestern University	Evanston, IL	Materials Science & Engineering	Ph. D., 2005
Vanderbilt University	Nashville, TN	Materials Physics	2005-2008

## Appointments

*Department of Chemical & Materials Engineering, University of Kentucky, Lexington, KY*

2018-Present	Director of Undergraduate Studies, Materials Engineering Program
2017-Present	Director of Graduate Studies, Materials Engineering Program
2016-Present	Associate Professor of Materials Engineering
2009-2016	Assistant Professor of Materials Engineering

*Department of Physics & Astronomy, Vanderbilt University, Nashville, TN*

2008-2009	Research Assistant Professor
2005-2008	Research Associate

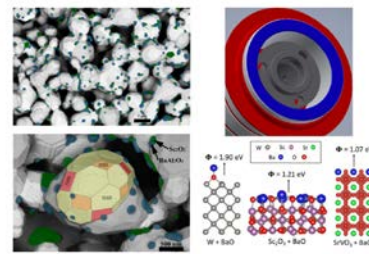
## Research Interests – Computational Materials Science @ UK

I am motivated to solve technologically-relevant problems in nanostructured and/or responsive materials, catalysis, and energy generation and storage by addressing fundamental materials questions using a range of calculation techniques. Of particular interest to me are problems centered on atomic-scale dynamics or complex structures, especially those requiring accurate treatment of electronic structure. Examples of such problems include the design and development of catalytic, thermionic, and photo-responsive materials with nanometer-scale features.

## Recent Products (\*=students advised by Prof. Beck)

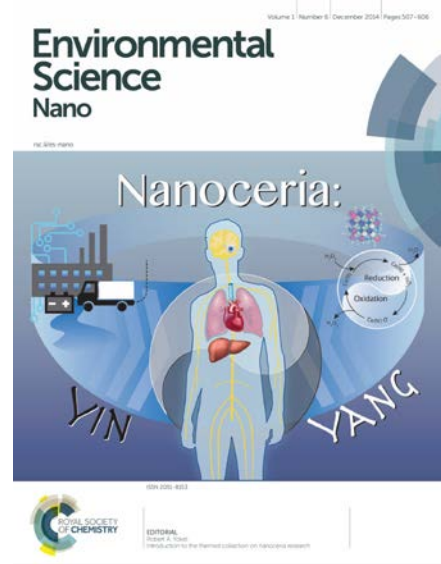
- Q. Zhou\*, X. Liu, T. Maxwell, B. Vancil, T. J. Balk, and M. J. Beck. “*Ba<sub>x</sub>Sc<sub>y</sub>O<sub>z</sub> on W (0 0 1), (1 1 0), and (1 1 2) in scandate cathodes: Connecting to experiment via  $\mu_0$  and equilibrium crystal shape*”, Appl. Surf. Sci., v. 458, pp. 827-838 (2018).
- D. M. Kirkwood, S. J. Gross, T. J. Balk, M. J. Beck, J. Booske, D. Busbaher, R. Jacobs, M. E. Kordesch, B. Mitsdarffer, D. Morgan, W. D. Palmer, B. Vancil, and J. E. Yater. “*Frontiers in Thermionic Cathode Research*”, IEEE Trans. Elect. Dev., v. 65 (6), pp. 2061-2071 (2018). **Cover Image**, components developed by M. J. Beck based on an image from T. J. Balk.
- M. Seif\* and M. J. Beck. “*Shape Memory Polymers: A Joint Chemical and Materials Engineering Hands-On Experience*”, Chem. Eng. Ed., v. 52 (1), pp. 60-67 (2018)..
- Q. Zhou\*, T. John Balk and M. J. Beck, “*Interplay of composition, structure, and electron density of states in W-Os cathode materials and relationship with thermionic emission*,” J. Vac. Sci. Tech. A, v. 35 (2), art. no. 021601 (2017).
- Q. Zhou\*, I Fursule, B. J. Berron, M. J. Beck, “*Toward spatiotemporally controlled synthesis of photoresponsive polymers: Computational design of azobenzene-containing monomers for light-mediated ROMP*,” J. Phys. Chem. A, v. 120 (36) pp. 7101-7111 (2016).

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### Other Significant Products:

- X. Huang\*, M. J. Beck, "Determining the Oxidation State of Small, Hydroxylated Metal-Oxide Nanoparticles with Infrared Absorption Spectroscopy", *Chem. Mater.*, v. 27, pp. 2965-2972 (2015).
- E. Grulke, K. Reed, M. Beck, X. Huang\*, A. Cormack and S. Seal, "Nanoceria: factors affecting its pro- and anti-oxidant properties", *Environmental Science: Nano*, v. 1, pp. 429-444 (2014). **\*Invited Critical Review, plus Cover Image of themed issue** (image w/ R. Yokel & M. Hazard)
- X. Huang\*, M. J. Beck, "Size-dependent appearance of intrinsic  $O_x^{\cdot}$  'activated oxygen' molecules on ceria nanoparticles", *Chem. Mater.*, v. 27, p. 5840 (2015).
- X. Huang\*, B. Wang, E. A. Grulke, M. J. Beck, "Toward tuning the surface functionalization of small ceria nanoparticles", *J. Chem. Phys.*, v. 140, art. 074703 (2014).
- D. Scopece\*, F. Montalenti, M. J. Beck, "Stability of Ge on Si (1 1 10) surfaces and the role of dimer tilting", *Phys. Rev. B*, v. 85, art. no. 085312 (2012).



### Awards

- *Tau Beta Pi Dr. Bruce Walcott Service Award (2016)*  
Awarded by the UK Tau Beta Pi chapter for scholarship, leadership, and service to the College of Engineering and the University of Kentucky.
- *Provost's Outstanding Teaching Award (2015)*  
This is the University of Kentucky's highest honor for teaching, and is competitively awarded to faculty who demonstrate special dedication and outstanding performance in the classroom or laboratory.
- *Outstanding Materials Engineering Teacher (2015)*  
Awarded to faculty members in the Materials Science & Engineering program on the basis of a student-based selection process.

### Synergistic Activities

- *Graduate Studies Committee, Undergraduate Studies Committee, College of Engineering, University of Kentucky*
- *Faculty Recruiting Contact/Presenter, University of Kentucky College of Engineering*  
I serve as the opening presenter for the UK College of Engineering's "Grand Tour", the principle on-campus recruiting activity put on by the college's Recruitment Office. In addition, I develop and lead recruiting activities focused on Materials Engineering for K-12 students, and have present to hundreds of students each year in both small and large group settings. My outreach activities reach well over 1000 K-12 students each year.
- *Proposal and Manuscript Reviewer*  
NSF DMR CMMT, Chemistry of Materials, ACS Catalysis
- *Senior Participant, Membranes Thrust and Batteries Thrust, Kentucky NSF EPSCoR Track 1*
- *Faculty Affiliate, University of Kentucky Center for Computational Sciences*