STEPHEN E. RANKIN, Ph.D.

Education and Training

Carnegie Mellon University	Pittsburgh, PA	Chemical Engineering	B.S., 1993
University of Minnesota	Minneapolis, MN	Chemical Engineering	Ph.D., 1998
U. Minnesota / Dow Corning Corp.	Minneapolis, MN	Polymer Chemistry	postdoc, 1999
Sandia National Laboratories	Albuquerque, NM	Molecular Simulations	postdoc, 2000

Research and Professional Experience

Co-Director of Graduate Studies, Chemical Engineering, 2009-2013 and 2018 - present.
Professor, Chemical & Materials Engineering, University of Kentucky, 2011 - present.
Associate Professor, Chemical & Materials Engineering, University of Kentucky, 2006 - 2011.
Assistant Professor, Chemical & Materials Engineering, University of Kentucky, 2000 - 2006.

My research background is in the fields of interfacial and chemical reaction engineering, especially as directed towards the synthesis of novel inorganic materials. This research encompasses the use of a variety of spectroscopic, surface analysis, materials characterization and computer simulation tools to understand novel materials and interfacial behavior. My interest in manipulating the behavior of self-assembled molecules as templates for novel metal oxide-based materials has led to collaborations on the development of novel synthetic approaches and applications for nanoporous films, membranes and particles. The challenges addressed with these tools include design and tuning of pore size, shape, orientation, and surface functionality for a variety of applications in separations, energy conversion and catalysis.

Honors and Awards

Teacher Who Made a Difference award, University of Kentucky College of Education, 2017
Faculty Associate, Center of Membrane Sciences, University of Kentucky, 2014 – present
Gill Professor of Engineering, University of Kentucky, 2007 – 2012
NSF CAREER Award for research regarding organic-inorganic hybrid materials, 2004
Faculty Associate, Center for Nanoscale Science and Engineering (CeNSE), University of Kentucky, 2002-present
U.S. Department of Energy Defense Programs Early Career Scientist and Engineer Award, 2000
Outstanding Poster Award, Materials Research Society National Meeting, San Francisco, CA, 1998
Doctoral Dissertation Fellowship, University of Minnesota, 1996-1997
National Science Foundation Graduate Fellowship, 1993-1996
Fannie and John Hertz Foundation Scholarship, 1993

Professional Activities

- Faculty associate in cross-cutting research programs at University of Kentucky, including NSF EPSCoR track 2 collaborative project with Louisiana State University on formation and applications of lignin derivatives (2016-present), NSF EPSCoR track 1 collaborative projects on materials and processes for the Kentucky bioeconomy (2014-present), and the Research Experiences for Undergraduates site on bioactive interfaces (2009-present).
- Mentored over 40 undergraduate and high school senior research projects including those of students from the Paul Laurence Dunbar High School Math, Science and Technology magnet program (2005-6) and Gatton Academy of Mathematics and Science in Kentucky (2011).
- Collaborated with startup companies in Central Kentucky since 2013 to develop SBIR and STTR projects based on innovative biological applications of nanoporous materials

- American Institute of Chemical Engineers (AIChE) Area 8D (Ceramics) National Meeting Program Chair, 2006-2009; co-chaired a total of 12 sessions AIChE National Meetings, 2000-2010.
- Developed a new undergraduate core course as part of a curriculum revision in 2004, *Computational Tools for Chemical Engineering,* and several graduate / senior undergraduate electives: *Computational Materials Science* (2001), *Advanced Materials* (2007) and *Intermolecular and Interfacial Engineering* (2014)

Recent publications (out of over 110 total)

1. S. Nagpure, Q. Zhang, M.A. Khan, S.Z. Islam, J. Zu, J. Strzalka, Y.-T. Cheng, B.L. Knutson, and S.E. Rankin, "Layer-by-layer synthesis of thick mesoporous TiO2 films with vertically oriented accessible nanopores and their application for lithium ion battery negative electrodes," *Advanced Functional Materials*, 28, 1801849, **2018**.
2. S.Z. Islam, A. Reed, S. Nagpure, N. Wanninayake, J.F. Browning, J. Strzalka, D.Y. Kim and S.E. Rankin, "Plasma Treated Hydrogen Doped Mesoporous Black TiO_2 Thin Films for Water Oxidation Photocatalysis," *Microporous and Mesoporous Materials*, 261, 35-43, **2018**.
3. S. Das, E.D. Oldham, H.-J. Lehmler, B.L**.** Knutson, S.E. Rankin, "Tuning the Position of Head Groups by Surfactant Design in Mixed Micelles of Cationic and Carbohydrate Surfactants." *Journal of Colloid and Interface Science*, 512, 428-438, **2018**.
4. D.M. Schlipf, S.E. Rankin, and B.L. Knutson, "Selective External Surface Functionalization of Large Pored Silica Materials Capable of Protein loading," *Microporous and Mesoporous Materials*, 244, 199-207, **2017**.
5. D.M. Schlipf, S. Zhou, M.A. Khan, S.E. Rankin, and B.L. Knutson, "Effects of Pore Size and Tethering on the Diffusivity of Lipids Confined in Mesoporous Silica," *Advanced Materials Interfaces*, 4(9), 1601103, **2017**.
6. M.A. Khan, W.T. Wallace, S.Z. Islam, S. Nagpure, J. Strzalka, J.M. Littleton, S.E. Rankin, and B.L. Knutson, "Adsorption and Recovery of Phenoloic Flavonoids using TiO_2 Functionalized Mesoporous Silica Nanoparticles," *ACS Applied Materials & Interfaces*, 9(37), 32114-32125, **2017**.
7. S. Joshi, H.-J. Lehmler, B.L. Knutson, and S.E. Rankin, "Imprinting of Stöber Particles for Chirally-Resolved Adsorption of Target Monosaccharides and Disaccharides," *New Journal of Chemistry*, 41(20), 11525-11532, **2017**.
8. S. Zhou, D.M. Schlipf, E.C. Guilfoil, S.E. Rankin, and B.L. Knutson, "Lipid Pore-Filled Silica Thin-Film Membranes for Biomimetic Recovery of Dilute Carbohydrates." *Langmuir*, 33(49), 14156-14166, **2017**.
9. S.Z. Islam, S. Nagpure, D.Y. Kim and S.E. Rankin, "Synthesis and Catalytic Applications of Non-metal Doped Mesoporous Titania," *Inorganics*, 5, article 15, **2017**.
10. S. Zhou, H.-F. Li, R. Garlapalli, S.E. Nokes, M. Flythe, S.E. Rankin, and B.L. Knutson, "Hydrolysis of Model Cellulose films by Cellulosomes: Extension of Quartz Crystal Microbalance Technique to Multienzymatic Complexes. " *Journal of Biotechnology*, 241, 42-49, **2017**.
11. S. Das, W. Xu, H.-J. Lehmler, A.F. Miller, B.L. Knutson, and S.E. Rankin, "Inverted Micelle-in-Micelle Configuration in Cationic/Carbohydrate Surfactant Mixtures." C*hemPhysChem*, 18(1), 79-86, **2017**.
12. S. Nagpure, J.F. Browning and S.E. Rankin, "Incorporating Poly(3-hexyl thiophene) into Orthogonally Aligned Cylindrical Nanopores of Titania for Optoelectronics," *Microporous and Mesoporous Materials*, 240, 65-72, **2017**.
13. M.K.C. Wooten, V.R. Koganti, S. Zhou, S., S.E Rankin, and B.L. Knutson, "Synthesis and Nanofiltration Membrane Performance of Oriented Mesoporous Silica Thin Films on Macroporous Supports." *ACS Applied Materials and Interfaces,* 8, 21806-21815, **2016**.
14. S.Z. Islam, A. Reed, N. Wanninayake, D.Y. Kim and S.E. Rankin, "Remarkable Enhancement of Photocatalytic Water Oxidation in N_2/Ar Plasma Treated, Mesoporous TiO_2 Films," *The Journal of Physical Chemistry C*, 120, 14069-14081, **2016**.