

# STEPHEN E. RANKIN

## *Curriculum Vitae*

University of Kentucky  
Chemical and Materials Engineering Department  
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### **EDUCATION**

Ph.D. Chemical Engineering, University of Minnesota, Minneapolis, 1998. Dissertation title: "Kinetic, Structural, and Reaction Engineering Studies of Inorganic/Organic Sol-Gel Copolymers."  
B.S. Chemical Engineering, Carnegie Mellon University, 1993 with University Honors and minor in Music.

### **PROFESSIONAL EXPERIENCE**

Co-Director of Graduate Studies, Chemical & Materials Engineering Department, University of Kentucky, 2009 – present.  
Associate Professor, Chemical & Materials Engineering Dept., University of Kentucky, 2006 – present  
Assistant Professor, Chemical & Materials Engineering Dept., University of Kentucky, 2000 – 2006.  
Postdoctoral Appointee, Sandia National Laboratories, September 1999 – August 2000  
Modeled coupled reaction and drying in ordered and disordered porous inorganic coatings, fibers, and particles.  
Postdoctoral Research Associate, University of Minnesota / Dow Corning Corporation, January–August, 1999  
Investigated silicone resin structure development from chlorosilanes in continuous reactors.  
Graduate Fellow / Research Assistant, Chemical Engineering and Materials Science Department, University of Minnesota, Minneapolis, MN, 1993-1998

### **TEACHING EXPERIENCE**

Developed & Taught *Computational Tools for Chemical Engineering* (UK EGR199) Springs 2004-2009;  
Developed & Taught *Advanced Materials* (UK CME 599 / CME 780) Fall 2007;  
Developed & Taught *Computational Materials Science* (UK CME 599 / MSE 620) Springs 2001 & 2002, Falls 2006 & 2008, and also offered remotely by ITV to University of Louisville in 2001 (ChE 694-76);  
Instructor of *Advanced Chemical Reactor Design* (UK CME 650) Spring 2010;  
Instructor of *Chemical Reactor Design* (UK CME 550) Fall 2003, Fall 2004, Fall 2005;  
Instructor of *Separation Processes* (UK CME 415) Fall 2000, Fall 2001, Fall 2002;  
Instructor of Introduction to Chemical Engineering (UK CME 101) Fall 2009;  
Instructor of chemical engineering *Seminar* course (UK CME 471) Spring 2007, Fall 2009;  
Team taught *Chemical Engineering Laboratory* (UK CME 433) Fall 2000, Fall 2002, Fall 2003;  
Recitation Instructor for *Chemical Engineering Thermodynamics and Kinetics* (University of Minnesota (UMN)ChEn 5202, Spring 1997);  
Teaching Assistant for *Process Evaluation and Design: Conceptual* (UMN ChEn 5501, Winter 1998);  
*Introduction to the Science of Materials* (UMN MatSci 5011, Fall 1995); and *Unit Operations and Separation Processes* (UMN ChEn 5104, Fall 1994).

### **HONORS AND AWARDS**

Gill Professor of Engineering, University of Kentucky, 2007 – present  
NSF CAREER Award for research regarding organic-inorganic hybrid materials, 2004  
U.S. Department of Energy Defense Programs Early Career Scientist and Engineer Award, "For the creation and use of innovative computer models which give fundamental scientific insights into the directed self-assembly of porous materials organized at the nanometer scale," 2000  
Outstanding Poster Award, Materials Research Society National Meeting, San Francisco, CA, 1998  
Outstanding Teaching Assistant Award, University of Minnesota Department of Chemical Engineering and Materials Science, 1998  
Doctoral Dissertation Fellowship, University of Minnesota, 1996-1997  
National Science Foundation Graduate Fellowship, 1993-1996  
Fannie and John Hertz Foundation Scholarship, 1993  
Olin Summer Research Program Award, 1993  
AIChE Outstanding Junior Award, Carnegie Mellon University, 1991  
R. K. Mellon National Merit Scholarship, 1989-1993

## RESEARCH FUNDING

### ACTIVE

- Collaborative Research: Design of Templated Ceramic Materials for Separation and Purification of Complex Carbohydrates*, National Science Foundation, 2010-2013, \$401,130. PI.
- CAREER: Kinetics and Engineering of Functional Nanoscale Organic-Inorganic Hybrids*, National Science Foundation, 2004-2010, \$405,500. PI.
- Separation and recovery of high value pentose derivatives from cellulosic biomass using molecular imprinting*, USDA (with Kentucky Office of Energy Policy matching), July 2008 – July 2011, \$1,366,214, co-PI (~28% effort) with B.L. Knutson (UK Chemical & Materials Engineering Department) PI and S.E. Nokes (UK Biosystems & Agricultural Engineering) and H.-J. Lehmler (U. Iowa Department of Occupational and Environmental Health) co-PIs.
- Nanoscale Materials and Architectures for Energy Conversion*, U.S. Department of Energy and Kentucky DOE EPSCoR, July 2007-July 2010, \$1,004,000 for U. Kentucky, technical PI at UK (~30% effort) with B. Hinds (UK Chemical & Materials Engineering Dept), M.P. Menguc (UK Mechanical Engineering Dept) and M. Menon (UK Center for Computational Sciences).
- IGERT: Building Leadership Through a Program on Engineered Bioactive Interfaces and Devices*, NSF, September 2007 – August 2012, \$3,000,000, one of 20 co-PIs (~5% effort, K.W. Anderson PI).
- REU Site: A Multidisciplinary Research Experience in Engineered Bioactive Interfaces and Devices*, NSF, July 2009 – June 2012, \$321,000, one of 14 co-PIs (~8% effort, K.W. Anderson PI).

### COMPLETED

- NIRT: Tailored Fluorinated Surfactant Templates for the Design of Ordered Nanoporous Ceramics*, National Science Foundation, August 2002 – July 2007, \$1,100,000, PI (~35% effort) with co-PIs B.L. Knutson (University of Kentucky (UK) Chemical and Materials Engineering Department) and H.J. Lehmler (University of Iowa Department of Occupational and Environmental Health)
- REU supplement, July 2003, \$6000
- Engineering the Evaporation-Driven Assembly of Nanostructured Ceramics*, Department of Energy, February 2003-February 2007, \$422,915, PI.
- Exploration of Nano-Scale Melting*, Kentucky Science and Engineering Foundation, January 2007 – December 2009, \$100,000, co-PI (~5% effort) with Pinar Mengüç (UK Mechanical Engineering Department) PI.
- Interfacially Controlled Incorporation of Transition Metal Oxides within Ordered Mesoporous Ceramics*, Kentucky Science and Engineering Foundation, January 2007 – December 2009, \$100,000, PI.
- Acquisition of X-Ray Diffraction Instrumentation for a Shared-Use Facility Serving the University and the Region*, National Science Foundation, October 2005 – September 2006, \$289,000, co-PI with H.G. Rowe PI (UK Geology Department), and co-PIs S. Rimmer, (UK Geology), M. Arthur (UK Forestry Department), and T. Li (UK Pharmaceutical Sciences).
- Molecular Imprinting to Control Cell Responses*, National Institutes of Health, September 2003 – March 2006, \$384,745 co-PI (10% effort) with D.A. Puleo PI (UK Biomedical Engineering Center), M.V. Thomas co-PI (UK College of Dentistry) and J.P. Williams co-PI (UK Department of Internal Medicine).
- Functionalization and Characterization of Huber-Silica Materials for High Value Applications*, Huber Corporation, April 2006 – March 2008, \$280,000, co-PI (~20% of effort) with D. Battacharyya (UK Chemical & Materials Engineering Department) PI.
- Kentucky Partnership for Nanoscale Electronics and Biotechnology*, Kentucky NSF EPSCoR, April 2005 – March 2008, \$1,600,000 for UK, co-PI (~5% effort) with Z. Chen PI (UK Electrical Engineering Department) and 12 other co-PIs at UK.
- Expanding Analytical Capabilities at UK for Surface Science and Nanotechnology Research*, University of Kentucky Vice President for Research Office, April-July 2007, \$38,100, PI.
- Postdoctoral Research in Nanostructured Materials Synthesis*, University of Kentucky Vice President for Research Office, April 2004 – October 2005, \$46,000, PI.
- Adsorption and Recovery of Dilute Fluorinated Surfactants for Nonaqueous Cleaning Applications*, Kentucky Science and Engineering Foundation, April 2002 – March 2005, \$195,740, co-PI (50% effort) with B.L. Knutson PI.

#### **PH.D. THESES SUPERVISED**

- B. Tan, *Controlled Synthesis And Functionalization Of Nanoporous Sol-Gel Silica Particles And Gels*, Ph.D. in Chemical Engineering **awarded** July 2005.
- V.R. Koganti, *Controlled Evaporation-Driven Synthesis of Ordered Nanoporous Ceramic Thin Films*, Ph.D. in Chemical Engineering **awarded** October 2006.
- R. Xing, *Investigation of the Assembly of Surfactants at the Solid-Liquid Interface for Adsorption and Materials Applications*, Ph.D. in Chemical Engineering **awarded** May 2007.
- X. Li, *Multiscale Dynamic Monte Carlo / Continuum Modeling of Drying and Curing in Sol-Gel Silica Films*, Ph.D. in Chemical Engineering **awarded** November 2008.
- M.S. Rahman, *Utilizing Mixed Surfactants for Simultaneous Pore Templating and Active Site Formation in Metal Oxides*, Ph.D. **awarded** February 2009.
- J. Ambati, *Kinetics and Synthesis of Organic-Inorganic Hybrid Materials*, Ph.D. 2010 (anticipated)
- S. Joshi, *Mixed Surfactant Assembly and Templating for Molecular Imprinting of Metal Oxides*, Ph.D. 2012 (anticipated). Co-advisor: Barbara Knutson.
- Q. Wu, *Synthesis and Energy Applications of Oriented Metal Oxide Nanoporous Films and Membranes*, Ph.D. 2010 (anticipated).

#### **M.S. THESES SUPERVISED**

- P.R. Elswick, *Molecular Imprinting of Silica with Glucose*, M.S. in Chemical Engineering, June 2004

#### **UNDERGRADUATE AND K-12 RESEARCH MENTORING**

- Mentored the junior/senior year research project of a student from the Math, Science and Technology Center of Paul Laurence Dunbar High School in Lexington, KY, 2005-6
- 3 "Bucks for Brains" Summer Undergraduate Research Program participants, 2003-2004, 2007-2008
- 4 NSF Research Experiences for Undergraduates (REU) summer researchers, 2003, 2007, 2009
- 1 University of Kentucky Undergraduate Research and Creativity Grant project, 2001
- 7 for-credit research projects at UK
- 6 paid undergraduate researchers for one or more semester at UK
- Supervised (with A.V. McCormick as primary advisor) 1 Minority Scholars undergraduate researcher, 1 Minnesota Supercomputer Institute summer fellow, and 5 for-credit research projects at UMN

#### **PROFESSIONAL SOCIETY MEMBERSHIPS**

- American Chemical Society, American Institute of Chemical Engineers, Materials Research Society, Society of Chemical Industry

#### **PROFESSIONAL SERVICE ACTIVITIES**

##### REVIEW PANELS AND AD HOC REVIEWS (~30-40 per year)

- National Science Foundation (Chemical, Biological, Transport & Environmental division; Division of Materials Research, Division of Chemistry)
- ACS Petroleum Research Fund
- U.S. Department of Energy
- Air Force Office of Scientific Research
- Journals including *Advanced Materials*, *Advanced Functional Materials*, *Analytical Chemistry*, *Angewandte Chemie*, *Applied Surface Science*, *Biotechnology Progress*, *Carbon*, *Chemical Communications*, *Chemistry: a European Journal*, *Chemistry Letters*, *Chemistry of Materials*, *Chemical Reviews*, *Colloids and Surfaces A & B*, *Environmental Science and Technology*, *European Journal of Inorganic Chemistry*, *Geochimica et Cosmochimica Acta*, *Industrial and Engineering Chemistry Research*, *Inorganic Chemistry*, *Journal of the American Ceramic Society*, *Journal of the American Chemical Society*, *Journal of Applied Physics*, *Journal of Biomedical Materials Research A*, *Journal of Colloid and Interface Science*, *Journal of Controlled Release*, *Journal of Materials Chemistry*, *Journal of Nanoscience and Nanotechnology*, *Journal of Non-Crystalline Solids*, *Journal of Physical Chemistry A & B*, *Langmuir*, *Macromolecules*, *Materials Chemistry and Physics*, *Materials Research Bulletin*, *Materials Research Society Symposium Proceedings*, *Microporous and Mesoporous Materials*, *Nanotechnology*, *Physical Chemistry Chemical Physics*, *Polymer Engineering and Science*, *Polymer International*, *Small*, *Soft Matter*, *Synlett*, *Thin Solid Films*, Wiley VCH (book proposal)

### TECHNICAL PROGRAMMING ACTIVITIES

- National Program Chair of American Institute of Chemical Engineers Area 8d (Ceramics) for 2009 Annual Meeting in Nashville, TN, November 2009.
- National Program Chair of American Institute of Chemical Engineers Area 8d (Ceramics) for 2008 Annual Meeting in Philadelphia, PA, November 2008.
- Co-Chair, *Nanostructured Thin Films and Modeling of Inorganic Materials Synthesis and Properties* sessions, 2008 AIChE Annual Meeting, Philadelphia, PA, November 2008.
- National Program Vice-chair of American Institute of Chemical Engineers Area 8d (Ceramics) for 2007 Annual Meeting in Salt Lake City, UT, November 2007.
- Co-Chair, *Nanostructured Thin Films and Modeling of Inorganic Materials Synthesis and Properties* sessions, 2007 Annual Meeting in Salt Lake City, UT, November 2007.
- National Program Chair of American Institute of Chemical Engineers Area 8d (Ceramics) for 2006 Annual Meeting in San Francisco, CA, November 2006.
- Chair, *Modeling of Inorganic Materials Synthesis and Properties and Advances in Porous Inorganic Materials I* sessions, 2006 AIChE Annual Meeting, San Francisco, CA, November 2006.
- Vice chair, *Nanostructured Thin Films* session, 2006 AIChE Annual Meeting, San Francisco, CA, November 2006.
- Chair, *Fluid/Particle Systems in Material Processing* session, 5<sup>th</sup> World Congress on Particle Technology, Orlando, FL, April 2006.
- Vice chair, *Nanostructured Thin Films* session, 2005 AIChE Annual Meeting, Cincinnati, OH, November 2005.
- Chair, *Control of Particulate Material Assembly Through Surface Chemistry* session, 2004 AIChE Annual Meeting, Austin, TX, 11/04
- Vice-Chair, *Nanostructured Adsorbent Materials* session, 2004 AIChE Annual Meeting, Austin, TX, 11/04
- Vice-chair, *Liquid Phase Synthesis of Nanomaterials and Particles* session, 2003 AIChE Annual Meeting, San Francisco, CA 11/03.
- Chair, *Liquid Phase Synthesis of Nanomaterials and Particles* session, 2002 AIChE Annual Meeting, Indianapolis, IN 11/02.
- Chair, *Cure and Degradation Kinetics of Network Forming Systems*, 2001 AIChE Annual Meeting, Reno, NV, 11/01.
- Co-chair, *Membrane Transport Models I* session, 12th Annual North American Membrane Society meeting, Lexington, KY, 5/01.
- Vice-chair, *Applications in Sol-Gel Derived Materials* session, 2000 AIChE Annual Meeting, Los Angeles, CA, 11/00

### UNIVERSITY SERVICE AND ADMINISTRATION

#### *Current Activities:*

- Co-Director of Graduate Studies of the Chemical & Materials Engineering Department, 2009-present.
- University of Kentucky Chemical Safety Committee member, 2006-present.
- Chemical & Materials Engineering Department Safety Committee member, 2006-present.
- Chemical & Materials Engineering Graduate Student Association advisor, 2004-present.
- Chemical & Materials Engineering Graduate Committee member, 2001-present.

#### *Past Activities:*

- Materials Science and Engineering Faculty Search Committee member, 2008-2009.
- Paducah Extended Campus Chemical Engineering Faculty Search Committee member, 2008-2009.
- Materials Science and Engineering Faculty Search Committee member, 2007-2008.
- Chemical & Materials Engineering Department Chair Reappointment Committee member, 2007.
- Chemical Engineering Alumni Relations Committee member, 2003-2005.

## PUBLICATIONS

### BOOK CHAPTER

S.E. Rankin, "Synthesis of Controlled Porosity Ceramics Using Bicontinuous Liquid Crystals", in M.L. Lynch and P.T. Spicer, eds. *Bicontinuous Liquid Crystals*, Taylor and Francis: Boca Raton, FL, 2005, pp. 243-284.

### IN PEER REVIEWED JOURNALS

- 50) R. Xing, H.-J. Lehmler, B.L. Knutson and S.E. Rankin, "Mixing and Demixing in Combined Hydrocarbon / Fluorocarbon Cationic Surfactant Templating of Mesoporous Silica," submitted to *The Journal of Physical Chemistry B* **2009**.\*
- 49) K. Ghosh, H.-J. Lehmler, S.E. Rankin and B.L. Knutson, "Supercritical Carbon Dioxide Swelling of Fluorinated and Hydrocarbon Surfactant Templates in Mesoporous Silica Thin Films," submitted to *The Journal of Physical Chemistry C* **2009**.
- 48) J. Ambati and S.E. Rankin, "DFT Calculations of Indirect  $^{29}\text{Si}$ - $^1\text{H}$  Spin-Spin Coupling Constants in Organoalkoxysilanes," revision in preparation for *The Journal of Physical Chemistry A* **2010**.\*
- 47) N.D. Meeks, S.E. Rankin and D. Bhattacharyya, "Sulfur-Functionalization of Porous Silica Particles and Application to Mercury Vapor Sorption," submitted to *Industrial and Engineering Chemistry Research* **2009**.
- 46) H.-J. Lehmler, S. Telua, S.M. Vyas, N.S. Shaikha, S.E. Rankin, B.L. Knutson and S. Parkin, "Synthesis and Solid State Structure of Fluorous Probe Molecules for Fluorous Separation Applications," *Tetrahedron* **2010** 66: 2561-2569.
- 45) X. Li and S.E. Rankin, "Multiscale Dynamic Monte Carlo / Continuum Model of Drying and Curing Nonideal Polycondensation in Sol-gel Silica Films," *AIChE Journal* **2010** in press.\*
- 44) M.S. Rahman and S.E. Rankin, "Ternary Lyotropic Liquid Crystalline Phase Diagram of Aqueous Mixtures of Maltoside and Cationic Surfactants and its Use for Predictive Synthesis Of Ordered Mesoporous Silica," *J. Colloid Interface Sci.* **2010** 342: 33-42.\*
- 43) G. Osei-Prempeh, A.-F. Miller, H.-J. Lehmler, B.L. Knutson and S.E. Rankin, "Fluorocarbon And Hydrocarbon Functional Group Incorporation Into Nanoporous Silica Employing Fluorinated And Hydrocarbon Surfactants As Templates," *Micropor. Mesopor. Mater.* **2010** 129: 189-199.\*
- 42) X. Li, J. Turánek, P. Knötingová, H. Kudláčková, J. Mašek, S. Parkin, S.E. Rankin, B.L. Knutson and H.-J. Lehmler, "Hydrophobic tail length, degree of fluorination and headgroup stereochemistry are determinants of the biocompatibility of (fluorinated) carbohydrate surfactants," *Colloids Surfaces B: Biointerfaces* **2009** 73: 65-74.
- 41) R. Xing, H.J. Lehmler, B.L. Knutson and S.E. Rankin, "Synthesis and Tuning of Bimodal Mesoporous Silica by Combined Hydrocarbon/Fluorocarbon Surfactant Templating," *Langmuir* **2009** 25: 6486-6492.\*
- 40) X. Li, J. Turánek, P. Knötingová, H. Kudláčková, J. Mašek, D.B. Pennington, S.E. Rankin, B.L. Knutson and H.-J. Lehmler, "Synthesis and Biocompatibility Evaluation of Fluorinated, Single-tailed Glucopyranoside Surfactants," *New J. Chem.* **2008** 32: 2169-2179.
- 39) K. Ghosh, S. Bashadi, H.-J. Lehmler, S.E. Rankin and B.L. Knutson, "Pore Size Engineering in Fluorinated Surfactant Templated Mesoporous Silica Powders through Supercritical Carbon Dioxide Processing," *Micropor. Mesopor. Mater.* **2008** 113: 106-113.
- 38) G. Osei-Prempeh, H.J. Lehmler, S.E. Rankin and B.L. Knutson, "Application of Fluoro-Functionalized Mesoporous Silica to Fluorous Separations," *Ind. Eng. Chem. Res.* **2008** 47: 530-538.
- 37) R. Xing and S.E. Rankin, "Reactive Pore Expansion During Ammonia Vapor Post-Treatment of Ordered Mesoporous Silica Prepared with Mixed Glucopyranoside and Cationic Surfactants," *Micropor. Mesopor. Mater.* **2008** 108: 65-76.\*
- 36) R. Xing and S.E. Rankin, "Use of the Ternary Phase Diagram of a Mixed Cationic / Glucopyranoside Surfactant System to Predict Mesostructured Silica Synthesis," *J. Colloid Interface Sci.* **2007** 316: 930-938.\*
- 35) K. Ghosh, S.M. Vyas, H.J. Lehmler, S.E. Rankin and B.L. Knutson, "Tailoring Porous Silica Films through Supercritical Carbon Dioxide Processing of Fluorinated Surfactant Templates," *J. Phys. Chem. B* **2007** 111: 363-370.
- 34) B. Tan, S.M. Vyas, H.J. Lehmler, B.L. Knutson and S.E. Rankin, "Synthesis of Inorganic and Organic-Inorganic Hybrid Hollow Particles Using a Cationic Surfactant with a Partially Fluorinated Tail," *Adv. Funct. Mater.* **2007** 17: 2500-2508.\*

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\* Rankin is corresponding author.

- 33) V.R. Koganti, D. Dunphy, V. Gowrishankar, M.D. McGehee, X. Li, J. Wang and S.E. Rankin, "Generalized Coating Route to Silica and Titania Films with Orthogonally Aligned Cylindrical Nanopore Arrays," *Nano Lett.* **2006** 6: 2567-2570.\*
- 32) B. Tan and S.E. Rankin, "Study of the Effects of Progressive Changes in Alkoxysilane Structure on Sol-Gel Reactivity," *J. Phys. Chem. B* **2006** 110:22353-22364.\*
- 31) B. Tan and S.E. Rankin, "Effect of Progressive Changes in Organoalkoxysilane Structure on the Gelation and Pore Structure of Templated and Non-Templated Sol-Gel Materials," *J. Non-Crystalline Solids* **2006** 352: 5453-5462.\*
- 30) S.M. Vyas, J. Turánek, P. Knötingová, A. Kašná, V. Kvardová, V. Koganti, S.E. Rankin, B.L. Knutson and H.L. Lehmler, "Synthesis and Biocompatibility Evaluation of Partially Fluorinated Pyridinium Bromides," *New J. Chem.* **2006** 30: 944-951.
- 29) R. Xing and S.E. Rankin, "Three Stage Multilayer Formation Kinetics During Adsorption of an Anionic Fluorinated Surfactant on Germanium 1. Concentration Effects" *J. Phys. Chem. B* **2006** 110: 295-304.\*
- 28) B. Tan, S.M. Vyas, H.J. Lehmler, B.L. Knutson and S.E. Rankin, "Unusual Dependence of Particle Architecture on Surfactant Concentration in Partially Fluorinated Decylpyridinium Templated Silica," *J. Phys. Chem. B* **2005** 109: 23225-23232.\*
- 27) B. Tan and S.E. Rankin, "Dual Latex/Surfactant Templating of Hollow Spherical Silica Particles with Ordered Mesoporous Shells," *Langmuir* **2005** 21: 8180-8187.\*
- 26) B. Tan, H.J. Lehmler, S.M. Vyas, B.L. Knutson and S.E. Rankin, "Fluorinated Surfactant-Templated Synthesis of Hollow Silica Particles with a Single Layer of Mesopores in their Shells," *Adv. Mater.* **2005** 17: 2368-2371.\*
- 25) G. Osei-Prempeh, H.J. Lehmler, B.L. Knutson and S.E. Rankin, "Fluorinated Surfactant Templating Of Vinyl-Functionalized Nanoporous Silica" *Micropor. Mesopor. Mater.* **2005** 85: 16-24.\*
- 24) K. Ghosh, H.J. Lehmler, S.E. Rankin and B.L. Knutson, "Supercritical Carbon Dioxide Processing of Fluorinated Surfactant Templated Mesoporous Silica Thin Films" *Langmuir* **2005** 21: 6145-6149.
- 23) B. Tan, H.J. Lehmler, S.M. Vyas, B.L. Knutson, and S.E. Rankin, "Large- and Small-Nanopore Silica Prepared with a Short-Chain Cationic Fluorinated Surfactant," *Nanotechnology* **2005**16: S502-S507.\*
- 22) V.R. Koganti and S.E. Rankin, "Synthesis of Surfactant-Templated Silica Films with Orthogonally Aligned Hexagonal Mesophase," *J. Phys. Chem. B* **2005** 109: 3279-3283.\*
- 21) B. Tan, H.J. Lehmler, S.M. Vyas, B.L. Knutson and S.E. Rankin "Controlling Nanopore Size and Shape by Fluorosurfactant Templating of Silica," *Chem. Mater.* **2005** 17: 916-925.\*
- 20) B. Tan and S.E. Rankin, "Interfacial Alignment Mechanism of Forming Spherical Silica with Radially Oriented Nanopores," *J. Phys. Chem. B* **2004** 108: 20122-20129.\*
- 19) B. Tan, A. Dozier, H.J. Lehmler, B.L. Knutson and S.E. Rankin, "Elongated Silica Nanoparticles with a Mesh Phase Mesopore Structure by Fluorosurfactant Templating," *Langmuir* **2004** 20: 6981-6984.\*
- 18) S.E. Rankin, B. Tan, H.J. Lehmler, K.P. Hindman and B.L. Knutson, "Well-Ordered Mesoporous Silica Prepared by Fluorinated Surfactant Templating," *Micropor. Mesopor. Mater.* **2004** 73: 197-202.\*
- 17) H. Huang, S.E. Rankin, L.S. Penn, R.P. Quirk and T.H. Cheong, "Transition from Mushroom to Brush During Formation of a Tethered Layer," *Langmuir* **2004** 20: 5770-5775.
- 16) J. Šefčík and S.E. Rankin, "Monte Carlo Simulations of Size and Structure of Gel Precursors in Silica Polycondensation," *J. Phys. Chem. B* **2003** 107: 52-60.\*
- 15) L.S. Penn, H. Huang, M.D. Sindkhedkar, S.E. Rankin, K. Chittenden, R.P. Quirk, R.T. Mathers and Y. Lee, "Formation of Tethered Nanolayers: Three Regimes of Kinetics," *Macromolecules* **2002** 35: 7054-7066.
- 14) S.E. Rankin and A.V. McCormick, "Reaction Engineering of Co-condensing (Methyl)ethoxysilane Mixtures: Kinetic Characterization and Modeling," *Macromolecules* **2000** 33: 7743-7750.
- 13) S.E. Rankin, L. J. Kasehagen, A.V. McCormick, and C.W. Macosko, "Dynamic Monte Carlo Simulation of Polycondensation with Extensive Cyclization," *Macromolecules* **2000** 33: 7639-7648.
- 12) S.E. Rankin and A.V. McCormick, "Hydrolysis Pseudoequilibrium: Challenges and Opportunities to Sol-Gel Silicate Kinetics," *Chem. Eng. Sci.* **2000** 55: 1955-1967.
- 11) S.E. Rankin and A.V. McCormick, "<sup>29</sup>Si NMR Investigation of Base-Catalyzed Hydrolytic Polycondensation of Dimethyldiethoxysilane," *Magn. Reson. Chem.* **1999** 37: S27-S37.
- 10) J. Šefčík, S.E. Rankin, S.K. Kirchner, and A.V. McCormick, "Esterification, Condensation, and Deprotonation Equilibria of Trimethylsilanol," *J. Non-Cryst. Solids* **1999** 258: 187-197.
- 9) S.E. Rankin, J. Šefčík, and A.V. McCormick, "Similarities in the Hydrolysis Pseudoequilibrium Behavior of Methyl-Substituted Ethoxysilanes," *Ind. Eng. Chem. Res.* **1999** 38: 3191-3198.
- 8) S.E. Rankin, J. Šefčík, and A.V. McCormick, "Trimethylethoxysilane Liquid-Phase Hydrolysis Equilibrium and Dimerization Kinetics: Catalyst, Nonideal Mixing, and the Condensation Route," *J. Phys. Chem. A* **1999** 103: 4233-4241.

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\* Rankin is corresponding author

- 7) S.E. Rankin, C.W. Macosko, and A.V. McCormick, "Importance of Cyclization during the Condensation of Hydrolyzed Alkoxysilanes," *Chem. Mater.* **1998** 10: 2037-2040.
- 6) S.E. Rankin, C.W. Macosko, and A.V. McCormick, "Sol-Gel Polycondensation Kinetic Modeling: Methylmethoxysilanes," *AIChE J.* **1998** 44: 1141-1156.
- 5) L.J. Kasehagen, S.E. Rankin, A.V. McCormick, and C.W. Macosko, "Modeling of First Shell Substitution Effects and Preferred Cyclization in Sol-Gel Polymerization," *Macromolecules* **1997** 30: 3921-3929.
- 4) S.E. Rankin, C.W. Macosko, and A.V. McCormick, "Copolymerization Kinetics of a Model Siloxane System," *J. Polym. Sci. A: Polym. Chem.* **1997** 35: 1293-1302.
- 3) L.J. Kasehagen, S.E. Rankin, A.V. McCormick, and C.W. Macosko, "Modeling of Non-Idealities in Sol-Gel Polymerization," *Polym. Mater. Sci. Eng.* **1996** 37: 356-357.
- 2) J. Sanchez, S.E. Rankin, and A.V. McCormick, "<sup>29</sup>Si NMR Kinetic Study of Tetraethoxysilane and Ethyl-substituted Ethoxysilane Polymerization in Acidic Conditions," *Ind. Eng. Chem. Res.* **1996** 35: 117-129.
- 1) J.B. Miller, S.E. Rankin, and E.I. Ko, "Strategies in Controlling the Homogeneity of Zirconia-Silica Aerogels: Effect of Preparation on Textural and Catalytic Properties," *J. Catal.* **1994** 148: 673-682.

#### MANUSCRIPTS IN PREPARATION

- 8) M.S. Rahman and S.E. Rankin, "Incorporation Of Isolated Ti Sites Into Silica Thin Films With 3-D Accessible Pores By Surfactant Complexation," in preparation.\*
- 7) R. Xing, H.-J. Lehmler, B.L. Knutson and S.E. Rankin, "Counterion Effects in the Formation of Hydrocarbon / Fluorocarbon Mixed Surfactant Templated Mesoporous Silica," in preparation.\*
- 6) X. Li and S.E. Rankin, "Ring Size Effects in a Multiscale Model of Sol-Gel Silica Film Formation: Tetrasiloxane Rings," in preparation.\*
- 5) X. Li and S.E. Rankin, "The Effects of Including Cyclization in a Multiscale Model of Sol-Gel Silica Film Drying and Curing" in preparation.\*
- 4) R. Xing and S.E. Rankin, "Protein-Accessible Hollow Mesoporous Silica Particles Prepared with Latex Microspheres and Reactive Pore expansion," in preparation.\*
- 3) V.R. Koganti and S.E. Rankin, "Monte Carlo Simulations of Confinement Effects on Hexagonal Lyotropic Liquid Crystals," in preparation.\*
- 2) V.R. Koganti and S.E. Rankin, "In-Situ FTIR Investigation of the Kinetics of Silica Polycondensation in Surfactant Templated, Mesostructured Thin Films," in preparation.\*
- 1) R. Xing and S.E. Rankin, "Three Stage Multilayer Formation Kinetics during Adsorption of an Anionic Fluorinated Surfactant onto Germanium 2. Solution pH and Salt Effects," in preparation.\*

#### PEER-REVIEWED CONFERENCE PROCEEDINGS

- 9) J. Ambati and S.E. Rankin, "<sup>29</sup>Si NMR Study of Bis(triethoxysilyl)ethane Polymerization Kinetics," Proceedings of the 50<sup>th</sup> Experimental NMR Conference, Ansilomar, CA, April 2009.
- 8) J. Ambati and S.E. Rankin, "<sup>29</sup>Si NMR Investigation of the Polymerization Kinetics of Bis(triethoxysilyl)ethane in Acidic Alcohol/water Solution," *Polym. Mater. Sci. Eng.* **2006**, 94: 610-611.\*
- 7) S.E. Rankin, B. Tan, R. Xing, S.M. Vyas, H.J. Lehmler and B.L. Knutson "Tuning The Mesopore Structure In The Shells Of Hollow Silica And Organosilica Particles Formed By Fluorosurfactant Templating," Proceedings, XXII Interamerican Congress of Chemical Engineering, Buenos Aires, Argentina, October 2006.
- 6) B.L. Knutson, K. Ghosh, S. Bashadi, S.E. Rankin and H.J. Lehmler, "Supercritical Carbon Dioxide Processing of Mesoporous Silica Templated by Fluorinated Surfactants," Proceedings, XXII Interamerican Congress of Chemical Engineering, Buenos Aires, Argentina, October, 2006.
- 5) B. Tan, W. Xu, A. Dozier and S.E. Rankin, "Preparation of Highly Dispersed Iron Oxide Nanoparticles in Amine-Modified SBA-15," *Mater. Res. Soc. Symp. Proc.* **2005** 876E: R4.11. \*
- 4) S.E. Rankin, B. Tan, H.J. Lehmler and B.L. Knutson, "Fluorinated Surfactant Templating of Ordered Nanoporous Silica," *Mater. Res. Soc. Symp. Proc.* **2003** 775: 47-52.\*
- 3) S.E. Rankin, A.P. Malanoski and F. van Swol, Monte Carlo Simulation of Self-Assembly during Dip Coating, *Mater. Res. Soc. Symp. Proc.* **2001** 636: 121-126.\*
- 2) S.E. Rankin and A.V. McCormick, Prospects for Chemical Control and Engineering of Organically Modified Ceramics, *Mater. Res. Soc. Symp. Proc.* **1999** 550: 243-248.
- 1) S.E. Rankin, C.W. Macosko, and A.V. McCormick, Sol-Gel Kinetics for the Preparation of Inorganic/Organic Siloxane Copolymers, *Mat. Res. Soc. Symp. Proc.* **1996** 435: 113-118.

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## UNREVIEWED CONFERENCE PROCEEDINGS AND REVIEWS

- 8) S.E. Rankin, *Review of Kinetics, Transport, and Structure in Hard and Soft Materials* (2005) by Peter F. Green, *Journal of Materials* online, <http://www.tms.org/pubs/journals/JOM/reviews/90.htm>, July 25, 2007.\*
- 7) L.S. Penn, H. Huang, D. Sindkhedkar, S.E. Rankin, R.P. Quirk and R.T. Mathers, Tethered Polymers for Surface Tailoring: Kinetics of Layer Construction, Proceedings, 25<sup>th</sup> Annual Meeting of the Adhesion Society, Orlando, FL, February 2002.
- 6) G.M. Wieber, G.B. Gardner, S.A. Hansen, E.D. Lipp, A.V. McCormick, and S.E. Rankin, Early Structure Development in the Hydrolytic Polycondensation of Chlorosilanes, Proceedings, International Conference on Organic-Inorganic Hybrids, University of Surrey, Guilford, UK, June 2000.
- 5) J. Sefcik, S.E. Rankin and A.V. McCormick, Control of Oligomer Size in Silicate-Containing Sol-Gel Composites, Proceedings of the AIChE Annual Meeting, Los Angeles, CA, November 2000.
- 4) S.E. Rankin and A.V. McCormick, Cyclization in Sol-gel Silicate Coatings, Proceedings of the AIChE Annual Meeting, Dallas, TX, November, 1999.
- 3) S.E. Rankin and A.V. McCormick, Kinetics and Reaction Engineering of Siloxane Copolymers, Proceedings of the AIChE Annual Meeting, Dallas, TX, November, 1999.
- 2) S.E. Rankin, C.W. Macosko, and A.V. McCormick, Kinetic and Structural Modeling of Alkoxysilane Hydrolytic Polycondensation, proceedings, 18<sup>th</sup> International Congress on Glass, San Francisco, July 1998.
- 1) S.E. Rankin, L.J. Kasehagen, C.W. Macosko, A.V. McCormick, and G.M. Wieber, A Kinetic Monte Carlo Model with Extensive Cyclization for Inorganic/Organic Copolymerization, Proceedings of the Society of Plastics Engineers ANTEC Meeting, Toronto, Canada, Apr. 27 - May 1, 1997. p. 1821.

## PRESENTATIONS

(Presenter is underlined)

**Invited**

- 16) S.E. Rankin and X. Li, "Multiscale Simulation of Sol-Gel Silica Polycondensation in Drying Films," 26th Annual Meeting of the Polymer Processing Society, July 4-8, 2010, Banff, Canada.
- 15) S.E. Rankin, Predictive Synthesis of Mesoporous Metal Oxide Adsorbents, Catalysts, and Membranes, University of Strathclyde, Glasgow, UK, 6/09.
- 14) S.E. Rankin, From Interface Science to Advanced Materials for Energy, Kentucky Innovation and Entrepreneurship Conference, Louisville, KY, 4/09.
- 13) S.E. Rankin, Design Principles for Surfactant-Templated Nanoporous Metal Oxides, Ohio State University, Columbus, OH, 11/08.
- 12) S.E. Rankin, Interfacial Engineering for the Synthesis of Porous Ceramic Materials, University of Louisville, Louisville, KY, 09/05.
- 11) S.E. Rankin, Interfacial Engineering for Designing Porous Ceramics, Vanderbilt University, Nashville, TN, 03/05.
- 10) S.E. Rankin, Design of Porous Ceramic Materials Through Interfacial Engineering, 3M, St. Paul, MN, 10/04.
- 9) S.E. Rankin, B. Tan, B.L. Knutson and H.J. Lehmler, Surfactant Templating Of Ordered Nanoporous Silica, Tristate Catalysis Society Meeting, Lexington, KY, 5/03.
- 8) L.S. Penn, H. Huang, S. Rankin, M. Sindkhedkar, R.P. Quirk, R. Mathers and Y. Lee, Construction of Tethered Nanolayers from Polymer Chains, Bryn Mawr College, Chemistry Department, 2/02.
- 7) S.E. Rankin, Modeling Aspects of Nanostructured Silicate Synthesis, University of Tennessee, Chemical Engineering Department, Knoxville, TN, 4/01.
- 6) S.E. Rankin, Kinetic Modeling of Siloxane-Containing Materials Synthesis, Georgia Institute of Technology, Materials Science and Engineering Department, Atlanta, GA, 2/01.
- 5) S.E. Rankin, Dynamic Monte Carlo Simulation of Silica Polycondensation, University of Louisville, Chemical Engineering Department, Louisville, KY, 2/01.
- 4) S.E. Rankin and A.V. McCormick, Alkoxysilane vs. Chlorosilane Network Formation, International Chemical Congress of Pacific Basin Societies, Honolulu, HI, 12/00.
- 3) S.E. Rankin and A.V. McCormick, Comparison Between NMR and Simulation of Formation of and Sorption in Silicate Networks, Symposium on Magnetic Resonance of Zeolites and Related Materials, University of Leipzig, 7/98.
- 2) S.E. Rankin, C.W. Macosko, and A.V. McCormick, Kinetic and Structural Modeling of Alkoxysilane Hydrolytic Polycondensation, 18th International Congress on Glass, San Francisco, CA, 7/98.
- 1) S.E. Rankin, L.J. Kasehagen, G.M. Wieber, C.W. Macosko, and A.V. McCormick, A Kinetic Monte Carlo Study of Cyclization in Inorganic/Organic Copolymers, Society of Plastics Engineers ANTEC meeting, Toronto, 4/97.

## Contributed Papers

- 122) J. Ambati, P. Wattamwar, T.D. Dziubla and S.E. Rankin, "Engineered silica for anti-oxidant enzyme loading and protection," American Chemical Society Meeting, San Francisco, CA, March 23, 2010
- 121) A. Abadie, S. Nokes, G. Osei-Prempeh, B. Knutson and S. Rankin, "Towards Recovery of Purified Streams of Feedstocks from Biomass for Novel Cellulosic Ethanol Co-Products," Institute of Biological Engineering Annual Meeting, Cambridge, MA, March, 2010.
- 120) Q. Wu and S.E. Rankin, "Preparation of ITO Mesoporous Thin Films by a Surfactant-Templated Sol-Gel Route," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November 13, 2009.
- 119) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin, H.-L. Lehmler and S. E. Nokes, "Effects of Functional Groups in Molecular Imprinted Silica On Adsorption of Sugars From Cellulosic Biomass," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November 12, 2009.
- 118) S. Joshi and S.E. Rankin, "Effects of Sugar Surfactant Architecture On Mixed Micelle Formation with Cationic Surfactants," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November 11, 2009.
- 117) J. Ambati and S.E. Rankin, "Dynamic Monte Carlo Simulation of Sol-Gel Polymerization of Bridged Alkoxysilanes," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November 10, 2009.
- 116) K. Bean, J. Ambati, P. Wattamwar, T. Dziubla, and S. Rankin, "Enzyme Loading and Activity in Nanoporous Metal Oxides," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November 9, 2009. (poster)
- 115) E.A. Conklin, S.E. Rankin and B.L. Knutson, "Molecular Imprinted Silica for Separation of Sugars From Cellulosic Biomass," American Institute of Chemical Engineers Annual Meeting, Nashville, TN, November 9, 2009. (poster)
- 114) S.E. Rankin, R. Xing and M.S. Rahman, "Sugar / Cationic Surfactant Templating of Functional Mesoporous Metal Oxides," 8<sup>th</sup> World Congress of Chemical Engineering, Montreal, Quebec, Canada, August 23-27, 2009.
- 113) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin, S.E. Nokes and H.J. Lehmler, "Molecular Imprinted Silica for Separation of Sugars from Cellulosic Biomass," 8<sup>th</sup> World Congress of Chemical Engineering, Montreal, Quebec, Canada, August 23-27, 2009.
- 112) S. Joshi, S.E. Rankin and H.J. Lehmler, "ITC study of mixed micelle formation in mixtures of sugar based and cationic surfactants," 238<sup>th</sup> American Chemical Society National Meeting, Washington, DC, August 16-20, 2009.
- 111) J. Ambati and S.E. Rankin, "Study of the reaction kinetics of bis(triethoxysilyl)ethane and methyltriethoxysilane," 238<sup>th</sup> American Chemical Society National Meeting, Washington, DC, August 16-20, 2009.
- 110) S.E. Rankin, Q. Wu and V.R. Koganti, "Evaporation-Driven Assembly and Tuning of Titania Thin Films with Orthogonally Aligned Hexagonal Channels," Kentucky Innovation and Entrepreneurship Conference, Louisville, KY, April 7, 2009.
- 109) S.E. Rankin, M.S. Rahman and S.T. Kahn, "Sweetening Kentucky's Energy Future with Functional Nanoporous Materials Prepared by Sugar-based Surfactant Templating," Kentucky Innovation and Entrepreneurship Conference, Louisville, KY, April 7, 2009.
- 108) J. Ambati and S.E. Rankin, "<sup>29</sup>Si NMR Study of Bis(triethoxysilyl)ethane Polymerization Kinetics," 50<sup>th</sup> Experimental NMR Conference, Ansilomar, CA, March 29 – April 3, 2009.
- 107) J. Ambati and S.E. Rankin, "Investigation of NMR Signal Loss during Hydrolytic Polycondensation of Organoalkoxysilanes," American Institute of Chemical Engineers Annual Meeting, Philadelphia, PA, November 16-21, 2008.
- 106) J. Ambati and S.E. Rankin, "DFT Calculation of <sup>29</sup>Si-<sup>1</sup>H Indirect Spin-Spin Coupling Constants in Organoalkoxysilanes," American Institute of Chemical Engineers Annual Meeting, Philadelphia, PA, November 16-21, 2008.
- 105) Q. Wu and S.E. Rankin, "Tuning the Wall Thickness, Pore Size, and Crystallinity of Mesoporous Titania Thin Films," American Institute of Chemical Engineers Annual Meeting, Philadelphia, PA, November 16-21, 2008.
- 104) S.E. Rankin, Q. Wu and V.R. Koganti, "Tuning the properties of orthogonally oriented hexagonal mesoporous titania for photovoltaics," 235<sup>th</sup> American Chemical Society National Meeting, New Orleans, LA, April 6-10, 2008.
- 103) S.E. Rankin, R. Xing, B.L. Knutson and H.J. Lehmler, "Synthesis and tuning of bimodal mesoporous silica by combined hydrocarbon/fluorocarbon surfactant templating," 235<sup>th</sup> American Chemical Society National Meeting, New Orleans, LA, April 6-10, 2008.

- 102) J. Ambati and S.E. Rankin, "Ab initio calculation of  $^1\text{H} - ^{29}\text{Si}$  coupling constants in organoalkoxysilanes," 235<sup>th</sup> American Chemical Society National Meeting, New Orleans, LA, April 6-10, 2008.
- 101) J. Ambati and S.E. Rankin, "Complexity from a Small Molecule: Unexpected NMR Spectral Patterns Observed from Selective Bridge  $^1\text{H}$  Coupling to  $^{29}\text{Si}$  in Bis(trimethoxysilyl)ethane," 49<sup>th</sup> Experimental NMR Conference, Ansilomar, CA, March 9-14, 2008.
- 100) S.E. Rankin and R. Xing, "Dual Latex / Surfactant Templated Synthesis fo Protein-Accessible Hollow Spherical Mesoporous Silica Particles," 07 AIChE Annual Meeting, Salt Lake City, UT, November 4-9, 2007.
- 99) X. Li and S.E. Rankin, "Multiscale Modeling of Cyclization Effects in Drying Sol-Gel Silica Films," 07 AIChE Annual Meeting, Salt Lake City, UT, November 4-9, 2007.
- 98) M.S. Rahman and S.E. Rankin, "Silica-Titania Mixed Oxide Mesoporous Thin Films: Incorporation of Ti by Surfactant Complexation," 07 AIChE Annual Meeting, Salt Lake City, UT, November 4-9, 2007.
- 97) S.E. Rankin, M.S. Rahman, R. Xing, S.M. Vyas, H.J. Lehmler and B.L. Knutson, "Synthesis of Mesoporous Silica using Mixed Surfactant Templates: Predictions from Ternary Liquid Crystal Phase Diagrams", 6<sup>th</sup> European Congress of Chemical Engineering, Copenhagen, Denmark, September 20, 2007.
- 96) S.E. Rankin and X. Li, "Cyclization effects in continuum / dynamic Monte Carlo model of drying and curing in sol-gel silica films", 6<sup>th</sup> European Congress of Chemical Engineering, Copenhagen, Denmark, September 18, 2007.
- 95) B.L. Knutson, K. Ghosh, S.E. Rankin and H.J. Lehmler, "Carbon dioxide processing of surfactant templated nano-structured silica probed by in-situ spectroscopy," 81<sup>st</sup> ACS Colloid and Surface Science Symposium, Newark, DE, June 24-27, 2007.
- 94) S.E. Rankin, R. Xing, B.L. Knutson and H.J. Lehmler, "Controlling demixed micelle architectures in silica particles templated with combined fluorinated and hydrogenated cationic surfactants," 81<sup>st</sup> ACS Colloid and Surface Science Symposium, Newark, DE, June 24-27, 2007.
- 93) J. Ambati and S.E. Rankin, "The Early-Time Polymerization Kinetics in Acidic Water/Alcohol Solutions of Bis(Trialkoxysilyl) Alkanes with Short Bridging Chains," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 92) X. Li and S.E. Rankin, "Multiscale Modeling of Coupled Drying and Nonideal Polymerization in Sol-Gel Silica Films," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 91) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin, and H.J. Lehmler, "Synthesis and Application of Fluorocarbon Functionalized Mesoporous Silica," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 90) R. Xing, H.J. Lehmler, B.L. Knutson and S.E. Rankin, "One Pot Synthesis of Ordered Biphasic Mesoporous Silica with 2D Hexagonal and Mesh Structure and Its Use for Controlled Deposition of Metal Oxides," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 89) M.S. Rahman and S.E. Rankin, "Ternary Phase Diagram of Cationic and Maltoside Surfactants in Water, and Its Use for Predictive Synthesis of Ordered Mesoporous Silica," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 88) V.R. Koganti and S.E. Rankin, "Synthesis and Crystallization of Titania Films with Orthogonally Aligned Hexagonal Close Packed Cylindrical Nanopores," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 87) K. Ghosh, S.E. Rankin, B.L. Knutson and H.J. Lehmler, "Pore Expansion in Fluorinated and Hydrocarbon Surfactant Templated Silica Thin Films Due to Supercritical Carbon Dioxide Processing," poster at American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 86) V.R. Koganti and S.E. Rankin, "Synthesis and Applications of Thin Ceramic Films with Oriented Nanopores Formed by Evaporation-Driven Self-Assembly," poster at American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 85) K. Ghosh, S.E. Rankin, B.L. Knutson and H.J. Lehmler, "In-Situ Fluorescence Spectroscopy Investigation of Supercritical Carbon Dioxide Swelling of Surfactant Templates in Porous Silica Thin Films," American Institute of Chemical Engineers 2006 Annual Meeting, San Francisco, CA, November 12-17, 2006.
- 84) S.E. Rankin and V.R. Koganti, "General Dip Coating Approach to Ceramic Films with Orthogonal Pore Arrays," XXII Interamerican Congress of Chemical Engineering, Buenos Aires, Argentina, October 1-4, 2006.
- 83) S.E. Rankin, B. Tan, R. Xing, H.J. Lehmler, S.M. Vyas and B.L. Knutson, "Tuning the Mesopore Structure in the Shells of Hollow Silica and Organosilica Particles Formed by Fluorosurfactant Templating," XXII Interamerican Congress of Chemical Engineering, Buenos Aires, Argentina, October 1-4, 2006.
- 82) B.L. Knutson, K. Ghosh, S. Bashadi, S.E. Rankin and H.J. Lehmler, "Supercritical Carbon Dioxide Processing of Mesoporous Silica Templated by Fluorinated Surfactants," XXII Interamerican Congress of Chemical Engineering, Buenos Aires, Argentina, October 1-4, 2006.

- 81) V.R. Koganti and S.E. Rankin, "Polycondensation kinetics of silicates in self-assembled mesostructured films," 80<sup>th</sup> ACS Colloid & Surface Science Symposium, Boulder, CO, June 18-21, 2006.
- 80) R. Xing and S.E. Rankin, "Unusual Three Stage Multilayer Adsorption of Anionic Fluorinated Surfactant onto Germanium: The Effects of Solution concentration, pH and Ionic Strength," 80<sup>th</sup> ACS Colloid & Surface Science Symposium, Boulder, CO, June 18-21, 2006.
- 79) R. Xing, H.J. Lehmler and S.E. Rankin, "Mixing and Demixing in Combined Hydrocarbon/Fluorocarbon Cationic Surfactant Templating of Mesoporous Silica," 80<sup>th</sup> ACS Colloid & Surface Science Symposium, Boulder, CO, June 18-21, 2006.
- 78) V.R. Koganti and S.E. Rankin, "Nano-crystalline titania films with orthogonally aligned nanopore arrays," Paper COLL0050 presented at 231<sup>st</sup> ACS National Meeting, Atlanta, GA, March 26-30, 2006.
- 77) S.E. Rankin, V.R. Koganti, F. van Swol and A.P. Malanoski, "Lattice Monte Carlo simulations of confinement effects on lyotropic surfactant liquid crystals," Paper COLL0396 presented at 231<sup>st</sup> ACS National Meeting, Atlanta, GA, March 26-30, 2006.
- 76) M.S. Rahman and S.E. Rankin, "Lyotropic phase behavior of aqueous cationic/maltoside surfactant mixtures and predictive synthesis of ordered mesoporous silica using these surfactants," Poster COLL0195 presented at 231<sup>st</sup> ACS National Meeting, Atlanta, GA, March 26-30, 2006.
- 75) X. Li and S.E. Rankin, "Multiscale modeling of coupled curing and drying in sol-gel silica films," Poster IEC0094 presented at 231<sup>st</sup> ACS National Meeting, Atlanta, GA, March 26-30, 2006.
- 74) H.Q. Huang, S.E. Rankin, A. Cammers and L.S. Penn, "Penetration and tethering behavior of free chains into polymer brushes," Fall National ACS Meeting, August 28 – September 1, 2005.
- 73) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin and H.J. Lehmler, "Bi-functionalized mesoporous silica synthesized using fluorinated surfactants as template," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 72) V.R. Koganti and S.E. Rankin, "Investigation of the curing kinetics in dip coated surfactant / sol-gel silica films," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 71) V.R. Koganti and S.E. Rankin, "Preparation and characterization of silica films with aligned cylindrical mesopores on porous substrates," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 70) R. Xing and S.E. Rankin, "ATR-FTIR study of adsorption kinetics and structural arrangement of an anionic fluorinated surfactant at germanium/water interface," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 69) R. Xing and S.E. Rankin, "The ternary phase diagram of a mixed cationic/glycoside surfactant/water system and its use for predictive synthesis of mesoporous materials," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 68) S.E. Rankin and X. Li, "Multiscale modeling of solvent-cast sol-gel ceramic films," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 67) S.E. Rankin, V.R. Koganti, W. Li, F. van Swol and A.P. Malanoski, "Monte Carlo simulations of the influence of nanoscale confinement on surfactant mesophases," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 66) J. Ambati and S.E. Rankin, "Comparison of the polymerization kinetics of bis(triethoxysilyl)ethane and methyltriethoxysilane under acidic conditions," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 65) K. Ghosh, H.J. Lehmler, S.E. Rankin and B.L. Knutson, "Pore Expansion in Cationic Fluorinated Surfactant Templated Porous Silica Thin Films through Supercritical Carbon Dioxide Processing," American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 64) B. Tan, S.M. Vyas, H.J. Lehmler, B.L. Knutson and S.E. Rankin, Synthesis and Characterization of Vesicular Nanoparticles Formed by Fluorinated Surfactant Templating, American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 63) S.E. Rankin and R. Xing, Influence of Ammonia Vapor Post-Treatment on the Structure of Mesoporous Silica Prepared with Mixed Cationic and Glycoside Surfactants, American Institute of Chemical Engineers Annual Meeting, Cincinnati, OH, October 31-November 4, 2005.
- 62) H. Huang, S.E. Rankin, A. Cammers, and L.S. Penn, Penetration and tethering behavior of free chains into polymer brushes, 230<sup>th</sup> ACS National Meeting, Washington, DC, August 28-September 1, 2005.
- 61) K. Ghosh, H.J. Lehmler, S.E. Rankin, and B.L. Knutson, Pore Expansion in Fluorinated Surfactant Templated Porous Silica Thin Films through Supercritical Carbon Dioxide Processing, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12–15, 2005.

- 60) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin and H.J. Lehmler, Synthesis of Fluorocarbon Functionalized Mesoporous Silica Using Fluorinated Surfactant Templates, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12–15, 2005.
- 59) B. Tan, S.E. Rankin, S.M. Vyas, H.J. Lehmler and B.L. Knutson, Opportunities Brought by Cationic Fluorinated Surfactants in Tuning the Mesoporous Silica Particle Architecture, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12 – June 15, 2005.
- 58) B. Tan and S.E. Rankin, Interfacial alignment of micelles in surfactant-silica aggregates as a general approach to materials with oriented mesopores, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12 – June 15, 2005.
- 57) R. Xing and S.E. Rankin, ATR-FTIR study of adsorption and structural arrangement of an Anionic Fluorinated Surfactant at Germanium/Water interface, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12 – June 15, 2005.
- 56) R. Xing and S.E. Rankin, Influence of ammonia vapor post-treatment on the porosity of mesoporous silica prepared with mixed cationic and glycoside surfactant via nanocasting, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12 – June 15, 2005.
- 55) R. Xing and S.E. Rankin, Mixed cationic and glycoside surfactants: Investigation of ternary phase diagram and predictive mesoporous materials synthesis, 79<sup>th</sup> ACS Colloid and Surface Science Symposium, Potsdam, NY, June 12 – June 15, 2005.
- 54) B. Tan and S.E. Rankin, Preparation and Characterization of Highly Dispersed Catalytic Metal Oxide Nanoparticles by Localized Deposition in Mesoporous Silica, Materials Research Society Spring 2005 Meeting, San Francisco, CA, March 28 – April 1, 2005.
- 53) B. Tan and S.E. Rankin, How Cationic Fluorinated Surfactant Structure Influences Mesoporous Silica Particle Architecture, Materials Research Society Spring 2005 Meeting, San Francisco, CA, March 28 – April 1, 2005.
- 52) V.R. Koganti and S.E. Rankin, Synthesis of Silica Films with Orthogonally Aligned Ordered Nanopore Arrays by Controlling Surface Chemistry, Materials Research Society Spring 2005 Meeting, San Francisco, CA, March 28 – April 1, 2005.
- 51) S.M. Vyas, V. Koganti, K.P. Murphy, S.E. Rankin, B.L. Knutson, H.-J. Lehmler, Novel fluorinated pyridinium surfactants: Synthesis and determination of Critical Aggregate Concentration (CAC), 229th ACS National Meeting, San Diego, CA, March 13-17, 2005.
- 50) V.R. Koganti and S.E. Rankin, Substrate surface effects on the pore orientation in mesoporous thin films: Perpendicular orientation of cylindrical pore channels using surface chemistry, AIChE National Meeting, Austin, TX 11/04.
- 49) P. Elswick and S.E. Rankin, Molecularly Imprinted Silica for Enhanced Glucose Adsorption, AIChE National Meeting, Austin, TX 11/04.
- 48) K. Ghosh, H.J. Lehmler, S.E. Rankin and B.L. Knutson, Supercritical Carbon Dioxide Processing of Thin Mesoporous Silica Films, AIChE National Meeting, Austin, TX 11/04.
- 47) B. Tan, H.J. Hemler, S.M. Vyas, B.L. Knutson and S.E. Rankin, Effects of Fluorinated Surfactant Structure on Nanopore Architecture in Templated Silica Particles, AIChE National Meeting, Austin, TX 11/04.
- 46) G. Osei-Prempeh, H.J. Lehmler, S.M. Vyas, S.E. Rankin and B.L. Knutson, Synthesis of Fluorocarbon Functionalized Mesoporous Silica Using Fluorinated Surfactant Templates AIChE National Meeting, Austin, TX 11/04.
- 45) B. Tan and S.E. Rankin, Synthesis of Porous Organic-Inorganic Hybrids: Effects of the Precursor Structure on Reaction Kinetics and Product Properties, AIChE National Meeting, Austin, TX 11/04.
- 44) B. Tan and S.E. Rankin, Amine-Functionalized Silica Spheres as a pH-Responsive Delivery System, AIChE National Meeting, Austin, TX 11/04.
- 43) B. Tan and S.E. Rankin, Re-Examination of the Mechanism to Form Spherical Silica Particles with Radially Oriented Mesopores, AIChE National Meeting, Austin, TX 11/04.
- 42) R. Xing, B.L. Knutson and S.E. Rankin, In Situ Analysis of Fluorinated Surfactant Adsorption at the Ge/Aqueous Solution Interface, AIChE National Meeting, Austin, TX 11/04.
- 41) W. Li and S.E. Rankin, Fine Lattice Monte Carlo Simulations of Self-Assembly, AIChE National Meeting, Austin, TX 11/04.
- 40) V. Koganti and S.E. Rankin, A New Synthetic Approach to Ceramic Thin Films Containing Ordered Arrays of Nanopores, Kentucky Nanomaterials Workshop, Lexington, KY 9/04.
- 39) B. Tan, A. Dozier and S.E. Rankin, Preparation of Highly Dispersed Iron Oxide Nanoparticles on Mesoporous Silica, Kentucky Nanomaterials Workshop, Lexington, KY 9/04.
- 38) K. Ghosh, H.J. Lehmler, S.E. Rankin and B.L. Knutson, Modification of the Pore Structure of Surfactant-Templated Thin Ceramic Films by CO<sub>2</sub> Processing, Kentucky Nanomaterials Workshop, Lexington, KY 9/04.
- 37) V. Koganti and S.E. Rankin, Orthogonal Alignment of Close-packed Channels in Dip-Coated Silica Films by Surface Chemistry Control, 78<sup>th</sup> ACS Colloid and Surface Science Symposium, New Haven, CT 6/04.

- 36) R. Xing, S.E. Rankin and B.L. Knutson, Adsorption of Fluorinated Surfactants at the Solid-Liquid Interface Mediated by Alkylammonium Cations, 78<sup>th</sup> ACS Colloid and Surface Science Symposium, New Haven, CT 6/04.
- 35) V. Koganti and S.E. Rankin, Controlled Orientation Of Surfactant-Templated Nanochannels In Silica Thin Films On Glass Substrates Using Surface Chemistry, ACS National Meeting, Anaheim, CA, 3/04.
- 34) B. Tan, S.E. Rankin, B.L. Knutson and H.J. Lehmler, Fluorinated Surfactants as Templates for Ordered Nanoporous Silica, AIChE Annual Meeting, San Francisco, CA, 11/03.
- 33) W. Li, S.E. Rankin, F. van Swol and A.P. Malanoski, Monte Carlo Simulations of Surface Texture Effects on a Confined Surfactant Mesophase, AIChE Annual Meeting, San Fransisco, CA, 11/03.
- 32) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin and H.J. Lehmler, Synthesis and Functionalization of Mesoporous Silica Materials Using Fluorinated Surfactant Templates, AIChE Annual Meeting, San Francisco, CA, 11/03
- 31) V. Koganti and S.E. Rankin, Using Surface Chemistry to Control Orientation of Surfactant-Templated Nanochannels in Silica Thin Films, Kentucky Nanomaterials Workshop (poster), Louisville, Kentucky, 9/03
- 30) B. Tan, H.J. Lehmler, B.L. Knutson and S.E. Rankin, Controlling Nanopore Size and Shape by Fluorosurfactant Templating of Silica, Kentucky Nanomaterials Workshop (poster), Louisville, Kentucky, 9/03
- 29) G. Osei-Prempeh, B.L. Knutson, S.E. Rankin and H.J. Lehmler, Synthesis And Functionalization Of Porous Silica Using Fluorinated Surfactant As Templates, Kentucky Nanomaterials Workshop (poster), Louisville, Kentucky, 9/03.
- 28) B. Tan, S.E. Rankin, H.J. Lehmler and B.L. Knutson, Fluorinated Surfacant Templating of Ordered Nanoporous Silica, 77<sup>th</sup> ACS Colloid and Surface Science Symposium, Atlanta, GA, 6/03.
- 27) W. Li, S.E. Rankin, A.P. Malanoski and F. van Swol, Monte Carlo Simulation of Wall Texture Effects on Confined Surfacant Mesophases, 77<sup>th</sup> ACS Colloid and Surface Science Symposium, Atlanta, GA, 6/03.
- 26) S.E. Rankin, B. Tan, H.J. Lehmler and B.L. Knutson, Fluorinated Surfactant Templating of Ordered Nanoporous Silica, Materials Research Society Spring Meeting, San Francisco, CA, 4/03.
- 25) L.S. Penn, H. Huang and S. Rankin, How Polymer Chains Become Tethered to Solid Surfaces, Symposium in Memory of Dr. Bernie Miller, TRI/Princeton, Princeton, NJ, 11/02.
- 24) B. Tan and S.E. Rankin, Kinetics of Bridged and Non-Bridged Amine-functional Silsesquioxane Synthesis, AIChE Annual Meeting, Indianapolis, IN, 11/02.
- 23) S.E. Rankin and L.S. Penn, Mesoscopic Simulations of the Kinetics of Polymer Nanolayer Tethering, AIChE Annual Meeting, Indianapolis, IN, 11/02.
- 22) L.S. Penn, H. Huang, M.D. Sindkhedkar, S.E. Rankin, R.P. Quirk, and R.T. Mathers, Tethered Polymers for Surface Tailoring: Kinetics of Layer Construction, 25th Annual Mtg. of the Adhesion Society, Feb. 10-14, 2002, Orlando, FL.
- 21) S.E. Rankin, A.P. Malanoski and F. van Swol, Interfacial Influence on Evaporation-Driven Amphiphile Assembly, AIChE Annual Meeting, Reno, NV, 11/01.
- 20) S.E. Rankin, Coupling Continuum Models and Monte Carlo Simulations for Drying Sol-Gel Films, AIChE Annual Meeting, Reno, NV, 11/01.
- 19) S.E. Rankin and B. Tan, Gelation and Structure Development in Bridged Silsesquioxanes, AIChE Annual Meeting, Reno, NV, 11/01.
- 18) S.E. Rankin, A.P. Malanoski, and F. van Swol, Monte Carlo Simulation of Interfacial Effects on Surfactant Mesophases, 75th ACS Colloid and Surface Science Symposium, Pittsburgh, PA, 6/01.
- 17) S.E. Rankin, A.P. Malanoski and F. van Swol, Modeling Aspects of Ordered Mesoporous Silicate Synthesis (poster), United Engineering Foundation meeting on *Refocusing Chemical Engineering*, Barga, Italy, 5/01.
- 16) S.E. Rankin, A.P. Malanoski, and F. van Swol, Simulation of Evaporation-Driven Self-Assembly, Materials Research Society Fall Meeting, Boston, MA, 11/00.
- 15) S.E. Rankin, A.P. Malanoski, and F. van Swol, Monte Carlo Simulation of Evaporation-Driven Self-Assembly, AIChE Annual Meeting, Los Angeles, CA, 11/00.
- 14) S.E. Rankin, P.R. Schunk and A.J. Hurd, Advected Ensemble Monte Carlo Approach to Sol-Gel Dip Coating, AIChE Annual Meeting, Los Angeles, CA, 11/00.
- 13) J. Sefcik, S.E. Rankin and A.V. McCormick, Control of Oligomer Size in Silicate-Containing Sol-Gel Composites, AIChE Annual Meeting, Los Angeles, CA, November 11/00.
- 12) S.E. Rankin, G.M. Wieber, S.A. Hansen, E.D. Lipp, and A.V. McCormick, Comparison of Chlorosilane and Ethoxysilane Polycondensation Kinetics (poster), AIChE Annual Meeting, Los Angeles, CA, 11/00.
- 11) G.M. Wieber, G.B. Gardner, S.A. Hansen, E.D. Lipp, A.V. McCormick, and S.E. Rankin, Early Structure Development in the Hydrolytic Polycondensation of Chlorosilanes, International Conference on Organic-Inorganic Hybrids, University of Surrey, Guilford, UK, 6/00.
- 10) S.E. Rankin and A.V. McCormick, Kinetics and Reaction Engineering of Siloxane Copolymers, AIChE Annual Meeting, Dallas, TX, 11/99.

- 9) S.E. Rankin and A.V. McCormick, Cyclization in Sol-Gel Silicate Coatings, AIChE Annual Meeting, Dallas, TX, 11/99.
- 8) S.E. Rankin, A.V. McCormick, and C.W. Macosko, Monte Carlo Simulation of Sol-Gel Silicate Fabrication (poster), Materials Research Society Fall Meeting, Boston, MA, 12/98.
- 7) S.E. Rankin and A.V. McCormick, Prospects for Chemical Control and Engineering of Organically Modified Ceramics, Materials Research Society Fall Meeting, Boston, MA, 12/98.
- 6) S.E. Rankin and A.V. McCormick, Reaction Engineering Approach to Bicomponent Alkoxysilane Cocondensation (poster), Materials Research Society Spring Meeting, San Francisco, CA, 4/98.
- 5) S.E. Rankin, L.J. Kasehagen, A.V. McCormick, and C.W. Macosko, Kinetic Monte Carlo Simulation of the Sol-Gel Process, AIChE Annual Meeting, Los Angeles, 11/97.
- 4) L.J. Kasehagen, S.E. Rankin, A.V. McCormick, and C.W. Macosko, Modeling of Non-Idealities in Sol-Gel Polymerization, ACS National Meeting, Orlando, FL, 8/96.
- 3) S.E. Rankin, C.W. Macosko, and A.V. McCormick, Sol-Gel Kinetics for the Preparation of Inorganic/Organic Siloxane Copolymers, MRS Spring Meeting, San Francisco, CA, 4/96.
- 2) E.I. Ko, J.B. Miller, and S.E. Rankin, Effect of Preparation Parameters on the Homogeneity of Zirconia/Silica Aerogels, AIChE Annual Meeting, St. Louis, MO, 11/93.
- 1) D.W. Ward, S.E. Rankin, and E.I. Ko, Effect of Gel Time on the Properties of Aerogels of Zirconia and Zirconia/Silica, 6th USA/Japan/China Trilateral Symposium on Catalysis, Beijing, China, 6/93.