

BRENT HOWARD SHANKS

Curriculum Vitae

Citizenship: United States

Position: Distinguished Professor, Chemical & Biological Engineering Department

Education:

B.S. Iowa State University (Chemical Engineering)	1983
M.S. California Institute of Technology (Chemical Engineering)	1985
Ph.D. California Institute of Technology (Chemical Engineering)	1988

Ph. D. Advisor: James E. Bailey

Professional Experience:

2015-present	Mike & Jean Steffenson Chair, Chemical & Biological Engineering, Iowa State University
2015-present	Anson Marston Distinguished Professor in Engineering, Iowa State University
2010-2015	Mike & Jean Steffenson Professor, Chemical & Biological Engineering, Iowa State University
2008-present	Director, NSF Engineering Research Center for Biorenewable Chemicals
2007-2010	Professor, Chemical & Biological Engineering, Iowa State University
1999-2007	Associate Professor, Chemical & Biological Engineering, Iowa State University
1997-1999	Department Manager, Shell Chemical Company, Houston, TX
1988-1997	Research Engineer, Shell Chemical Company, Houston, TX
1984-1988	Research Assistant, California Institute of Technology
1985	Research Engineer, General Motors Research Laboratories, Warren, MI
1983	Development Engineer, General Electric Corporation, Mount Vernon, IN
1982-1983	Undergraduate Research, Iowa State University
1982	Process Engineer, Texas Instruments, Austin, TX
1981	Research Trainee, Ames Laboratory, Iowa State University

Honorary and Professional Societies:

American Chemical Society
 American Institute of Chemical Engineers
 North American Catalysis Society
 Omega Chi Epsilon
 Tau Beta Pi

Special Appointments or Awards:

State of Iowa Scholarship	1979-1980
Cargill Scholarship	1981-1982
Senior Design Award	1983
Senior Research Fellowship	1982-1983
Shell Oil Foundation Scholarship	1982-1983
Graduation with Distinction, Iowa State University	1983
General Electric Company Graduate Fellowship	1983-1984
Shell Special Recognition Award	1993, 1997
VEISHEA Engineering Faculty of the Year	2000
Shell Faculty Fellow	2000-2002
Teaching Award, AIChE Student Chapter	2001, 2002, 2003, 2005, 2006, 2008, 2009, 2011
ISU Engineering Student Council Leadership Award	2004
ISU Superior Engineering Teacher Award	2007
ISU Award for Outstanding Career Achievement in Research	2012
ISU David R. Boylan Eminent Faculty Research Award	2012

Research Activities:

Research Interests

Heterogeneous catalysis.
 New catalytic routes to chemical products from biobased feedstocks.
 Mesoporous metal oxide supports.
 Novel process coupling of reactor/catalyst combinations.

Research Experience at Shell Chemical Company

Dehydrogenation Catalysis: Development of new catalysts for ethylbenzene dehydrogenation with subsequent scale-up to manufacturing. Provided technical support (process modeling, performance analysis, troubleshooting, start-up support) to customers using dehydrogenation catalysts.

Oxidation Catalysis: Supplied technical support to ethylene oxide catalyst customers.

New Catalyst Opportunities: Worked with Shell's catalyst businesses to identify catalyst business opportunities.

Industrial Management Experience:

Catalysis Areas: dehydrogenation, hydrogenation, oxidation, disproportionation, spent catalyst metal reclamation, alternative catalytic reactor designs.

Research Department: 19 staff members with annual budget of >\$4 MM.

Teaching Experience:

Iowa State University:

Primary Instructor:

ChE 406 (Undergrad.) “Environmental Chemodynamics”	F01-03
ChE 430 (Undergrad.) “Process and Plant Design”	F00
ChE 358 (Undergrad.) “Separations”	S00-03, F07, S11
ChE 382 (Undergrad.) “Chemical Reaction Engineering”	2004-06, 2008-09, F13, S15, S17
ChE 601 (Grad.) “Seminar Series”	2001-03
ChE 688/BR C 688 (Grad.) “Catalysis and Catalytic Processes”	S04, S07, S10, S13, S16
ChE 690 (Grad.) “Advanced Topics”	F99
BRT 590 (Grad.) “Evolving Chemical Industry”	F10

Secondary Instructor:

ChE 325 (Undergrad.) “Chemical Engineering Laboratory I”	F99
ChE 426 (Undergrad.) “Chemical Engineering Laboratory II”	F99
BRT 501 (Grad.) “Fundamentals of Biorenewable Resources”	S03

Extension:

“Biodiesel Analytical Methods” workshops	12/02, 8/03
“Biodiesel Production Technology” workshops	2/03, 3/03, 5/03, 8/03
“Biodiesel Technology Workshops”	3/04, 10/04, 10/05, 7/06, 10/06, 7/07, 10/07, 7/08, 7/09

Rice University:

Guest Lecturer Ceng 301 (Undergrad.) “Chemical Engineering Fundamentals”	F94
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Caltech:

ChE 163 (Grad.) “Chemical Kinetics & Reaction Engineering” (w/ J.E. Bailey)	F84
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University Service:

University:

President Search Committee	2017-present
Board of Directors, Iowa State University Research Park	2013-present
CCUR/BCRF Director Search Committee	2014-15
Leading the Bioeconomy Working Team	2014-15

Enhancing Institutional Excellence Committee, Federally Funded Competitive Grants Subcommittee, Co-Chair	2013-14
Bioeconomy Institute, Science & Engineering Committee	2006-10
Biorenewables Building Committee	2007-present
Biotechnology Council	2005-08
University Honors Committee	2004-08
Biorenewable Resources Consortium Advisory Board	2002-04
Center for Catalysis Advisory Board	2002-06
Office of Biorenewable Programs, Science & Engineering Committee	2002-06
Biorenewable Resources & Technology Graduate Program Coordinating Committee	2002-06
Director of Graduate Education and Chair	2002-04
Co-Chair, Search Committee	2003-04

Extension:

Iowa Industries of the Future (IOF) Advisory Board	2000-03
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Engineering College:

Dean Search Committee	2012
Co-op/Intern Task Group	2000-08
MARL Advisory Committee	2007-12

Chemical & Biological Engineering:

Chair Search Committee	2012-13
Graduate Program Committee	1999-2008
Director of Graduate Education	2007-08
CEGSO Faculty Advisor	2004-07
Faculty Search Committee	2002-04, 2009-11, 2015-16
Curriculum Committee	1999-2002
Undergraduate Recruiting and Minority Student Enhancement Committee	1999-2001, 2005-08
Planning & Governance Committee (Chair 2001-02)	1999-2002
AIChE Student Chapter President	1982-1983
Co-Chair AIChE Midwest Regional Student Conference	1983

Rice University:

Sid Rich College Associate	1998-1999
Wiess College Associate	1989-1995

Professional Service:Offices

Southwest Catalysis Society Director	1997-1999
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Editorial Boards

<i>Applied Catalysis A: General</i>	2009-present
<i>ChemSusChem</i>	2011-present
<i>Catalysis Communications</i>	2012-present

Session Chair

Co-Chair, Biobased Industrial Products, AIChE Annual Mtg., Reno, NV	2001
Chair, Chemical Conversions and Processes for Renewable Feedstocks, AIChE Annual Mtg., Indianapolis, IN	2002
Co-Chair, Chemical Conversions and Processes for Renewable Feedstocks, AIChE Annual Mtg., San Francisco, CA	2003
Chair, Chemical and Catalytic Conversions for Renewable Feedstocks, AIChE Annual Mtg., Austin, TX	2004
Co-Chair, Catalysis of Pharmaceuticals, Specialties and Biorenewables, 19 th North American Catalysis Society Meeting, Philadelphia, PA	2005
Vice Chair, Envisioning Biorefineries Topical Session, AIChE Annual Meeting, Cincinnati, OH	2005
Co-Chair, New Platform Chemicals and Chemical Building Blocks for Petrochemicals Symposium, 237 th ACS National Meeting, Salt Lake City, UT	2009
Co-Chair, Catalysis for Energy, 21 st North American Catalysis Society Meeting, San Francisco, CA	2009
Chair, Complex Carbohydrates to Useful Chemicals, 22 nd North American Catalysis Society Meeting, Detroit, MI	2011
Chair, Biomass Conversion, 22 nd North American Catalysis Society Meeting, Detroit, MI	2011
Co-Chair, Catalytic Biomass Conversion to Chemicals, AIChE Annual Meeting, Minneapolis, MN	2011
Co-Chair, Chemicals and Oils from Coal and Biomass, 6 th Sino-US Joint Conference of Chemical Engineering, Beijing, China	2011
Chair, Acid-Base Bifunctional Catalysis, 243 rd ACS National Meeting, San Diego, CA	2012
Co-Chair, Catalysis for Renewable Energy, 244 rd ACS National Meeting, Philadelphia, PA	2012
Co-Chair, Catalytic Biomass Conversion to Chemicals, AIChE Annual Meeting, Pittsburgh, PA	2012
Chair, Biomass Conversion to Chemicals I, 23 rd North American Catalysis Society Meeting, Louisville, KY	2013
Co-Chair, James Katzer Memorial Session, AIChE Annual Meeting, San Francisco, CA	2013
Co-Chair, Catalytic Biomass Conversion to Chemicals, AIChE Annual Meeting, San Francisco, CA	2013

Reviewer

ACS Catalysis, ACS Sustainable Chemistry & Engineering, Advanced Functional Materials, Advanced Materials, AIChE Journal, Applied Catalysis A: General, Applied

Catalysis B: Environmental, Bioresource Technology, Biotechnology Progress, Catalysis Communications, Catalysis Today, Catalyst Science & Technology, Chemical Communications, Chemical Engineering Science, Chemistry A – European Journal, Chemistry of Materials, ChemCatChem, ChemSusChem, Energy & Fuels, Energy Technology, European Journal of Inorganic Chemistry, FUEL, Green Chemistry, Industrial and Engineering Chemistry Research, Journal of Applied Electrochemistry, Journal of Catalysis, Journal of Inorganic Chemistry, Journal of Micromechanics and Microengineering, Journal of Molecular Catalysis A: Chemical, Journal of the American Chemical Society, Journal of the American Oil Chemists' Society, Journal of Applied Electrochemistry, Journal of Physical Chemistry A, Journal of Physical Chemistry B, Materials Science & Engineering A, Microporous Mesoporous Materials, Nanotechnology, Nature, Nature Communications, Science, Small, Topics in Catalysis

Proposals – National Science Foundation, Petroleum Research Foundation, The Consortium for Plant Biotechnology, US Department of Energy, United States-Israel Binational Science Foundation, Energy Biosciences Institute

National Science Foundation, ERC Program 1998
 National Science Foundation, Panel Member 2000, 2005, 2006, 2007, 2009, 2010
 US Department of Energy, UCR Program 2004

Public Service

Biotech Advisory Committee, Ellsworth Comm. College, Iowa Falls, IA 2006-2010

Other

Organizing Committee, DOE Bioproducts and Bioenergy Conference, Ames, IA 2000
 National Academy of Sciences – Challenges for the Chemical Sciences in the 21st Century
 Workshop on the Environment November 2002
 Organizing Committee, NSF Workshop, Catalysis for Biorenewables Conversion,
 Washington, DC April 2004
 Chair, NSF Workshop, Design of Catalyst Systems for Biorenewables,
 Washington, DC June 2005
 Organizing Committee, NSF Workshop, Breaking the Chemical and Engineering Barriers
 Lignocellulosic Biofuels, Washington, DC June 2007
 Scientific Advisory Committee, ASPECT (Advanced Sustainable Processes Engaging
 Catalytic Technologies), Netherlands 2009
 Advisory Board, Wi(PR)EM, University of Puerto Rico – Mayaguez 2009-14
 Organizing Committee, TCS2010 Symposium on Thermal and Catalytic Sciences,
 Ames, IA 2010
 Scientific Board, 1st International Congress on Catalysis for Biorefineries (CatBior),
 Malaga, Spain 2011
 Organizing Committee, National Panel on the Carbon-Negative Economy, Chicago, IL
 2011
 Organizing Committee, Council for Chemical Research Annual Meeting, Deerborn, MI
 2012
 Advisory Board, Frontiers in Biorefining 2012 Conference, St. Simon's Island, GA 2012
 Advisory Board, Energy Biosciences Institute, BP/Berkeley/Illinois 2013-15

Break-out Session Lead, DOE-BER Bioenergy Workshop, Washington, DC	2014
Chair, NSF Workshop, Advanced Manufacturing of Biobased Chemicals through Integrated Biology and Chemistry, Arlington, VA	2015
Chair, NSF Workshop, Bioprivileged Molecules through Integrated Biology and Chemistry, Arlington, VA	2017
Organizing Committee, DOE BETO Workshop, Moving Beyond Drop-In Replacements: Performance Advantaged Bio-Based Chemicals, Denver, CO	2017
Testimony on biobased chemicals before the U.S. Senate Agriculture Committee, Washington, D.C.	2017

Technical Consulting

ATOFINA Petrochemicals, Inc.
 Cargill
 DeWaay Financial Network
 Grain Processing Corporation
 O.I. Analytical
 Shell Chemicals
 Sud-Chemie Inc.
 The Catalyst Group Resources
 United Environment & Energy, LLC

Entrepreneurial Activities:

Glucan Biorenewables, LLC, co-founder, 2012
 SusTerea Biorenewables, LLC, co-founder, 2013
 Sumatra Biorenewables, LLC, co-founder, 2015

Funding:

Current

1. PI – “ERC: Center for Biorenewable Chemicals,” (co-PI, B. Nikolau), NSF, \$35,260,000, 9/08-8/18.
2. PI – “Deoxygenation of Lignin-Derived Species to Aromatics and Olefins,” Iowa Energy Center, \$94,598, 1/17-12/17.

3. PI at Ames Lab – “Agile BioFoundry,” DOE BETO, (co-PI, J.P. Tessonier), \$137,000, 10/16-9/17.
4. co-PI – “STTR Phase I: Aromatics from Pyrones,” (PI – SusTerea Biorenewables, LLC, co-PI, George Kraus), NSF, \$225,000, 7/16-6/17.
5. PI – “Bioprivileged Molecules through Integrated Biology and Chemistry,” NSF Supplemental Award, \$275,000, 9/16-12/17.

Previous

1. PI - “Synthesis of Alumina Mesoporous Molecular Sieves,” (co-PI, M. Pruski), Institute for Physical Research and Technology, Iowa State University, \$58,000, 10/99-9/00.
2. PI - “Assessment of Biomass-Based Feedstocks for Fuels and Chemicals,” Iowa Energy Center, \$10,580, 7/00-8/00.
3. PI - “Criterion Faculty Fund,” Criterion Catalyst Company, \$15,000, 8/00-7/01.
4. PI - “Solid Base Catalysts for Triglyceride Transesterification to Biodiesel,” SPRIG, Iowa State University, \$13,580, 1/01-12/01.
5. PI - “Methyl Ester Production from High Free Fatty Acid Feeds – Iowa Biotechnology Byproducts Consortium,” (co-PI, J. Van Gerpen), USDA, \$55,367, 7/01-6/02.
6. co-PI - “Conversion of Lignocellulose to Value-Added Products – Iowa Biotechnology Byproducts Consortium,” (PI, R.C. Brown; co-PI, A.L. Pometto, T.L. Peeples), USDA, \$107,550, 7/01-6/02.
7. PI - “Faculty Initiation Grant,” Shell Oil Company, \$60,000, 11/99-10/02.
8. co-PI – “Development of Biodiesel Educational Tools,” (PI, J. Van Gerpen; co-PIs, R. Kellogg, R. Pruszko), USDOE-NREL, \$213,400, 1/02-6/03.
9. co-PI – “Creating the BioEconomy of the 21st Century,” Presidential Academic Initiative (PI, S. Johnson; co-PIs, R.C. Brown, L.A. Johnson, G.A. Kraus, B. Nikolau, T.L. Richard), Iowa State University, \$330,000, 1/02-6/03.
10. PI – “Designed Catalyst Systems for the Efficient Conversion of Soybean Oil to Value-Added Oxidation Products,” (co-PIs, V. S.-Y. Lin, G.A. Kraus), Matching Funds, Iowa Energy Center, \$16,000, 7/02-6/03.

11. PI – “Designed Catalyst Systems for the Efficient Conversion of Soybean Oil to Value-Added Oxidation Products,” (co-PIs, V. S.-Y. Lin, G.A. Kraus), Biorenewable Resources Consortium, USDOE, \$125,000, 9/02-8/03.
12. PI – “Catalytic Conversion of Corn Fiber to Hydrogen,” (co-PIs, V. S.-Y. Lin, M. Pruski), Green Chemistry Catalysis Laboratory, USDOE, \$73,000, 8/02-7/03.
13. co-PI – “Corn Stover Recovery for Chemicals and Fiber Composites – Iowa Biotechnology Byproducts Consortium,” (PI, T.L. Richard , co-PIs, M. Kuo, K. Moore), USDA, \$149,416, 7/02-6/03.
14. PI – “Development of a Catalyst/Sorbent for Methane Reforming,” (co-PI, T.D. Wheelock), USDOE, \$50,000, 10/02-9/03.
15. co-PI – “Multi-Disciplinary Education and Training in Biobased Products: Graduate Major in Bioresource Engineering,” (PI, R.C. Brown; co-PIs, G.A. Kraus, L.A. Johnson), USDOE, \$375,000, 7/01-6/04.
16. PI – “Catalytic Conversion of Lignocellulose-Derived Sugars to Polyols,” Iowa Energy Center, \$87,197, 7/01-6/04.
17. PI – “Catalytic Conversion of High Free Fatty Acid Oils to Alkyl Esters– Iowa Biotechnology Byproducts Consortium,” (co-PIs, J. Van Gerpen, G.L. Schrader, V. S.-Y. Lin), USDA, \$175,000, 8/03-7/05.
18. PI – “Styrene Catalysts: Fundamentals of Operation at Low S/O Ratios,” CRI Catalyst Company, \$75,000, 7/02-12/04.
19. co-PI – “Molecular Modeling for the Catalytic Conversion of Biorenewables,” (PI, W.S. Jenks), SPRIGS, Iowa State University, \$16,000, 1/04-12/04.
20. co-PI – “Hybrid Thermal/Biological Conversion to Industrial Chemicals, (PI, R.C. Brown, co-PI, C. Hanson), Iowa Energy Center, \$313,055, 7/03-6/05.
21. co-PI – “Gasification of Switchgrass,” (PI, R.C. Brown, co-PI, T.D. Wheelock, R.O. Fox, F. Battaglia), USDOE, \$730,000, 10/04-9/05.
22. PI – “New Faculty Grant Program,” Corn Refiners Association, \$60,000, 8/02-7/05.
23. co-PI – co-PI, “Hybrid Organic-Inorganic Catalyst for Cellobiose Hydrolysis,” (PI, P.J. Reilly), Center for Catalysis, USDOE, \$90,000, 7/05-6/06.
24. PI at ISU – “Development of Sustainable Biobased Products and Bioenergy in Cooperation with the Midwest Consortium for Sustainable Biobased Products and Energy, (Prime – M. Ladisch, Purdue University), USDOE, \$162,000 (ISU portion), 10/04-6/07.

25. PI – “Synthesis and Application of Alumina with Hierarchical Nanoporous Structure,” Petroleum Research Fund, Type AC, American Chemical Society, \$80,000, 9/04-8/07.
26. PI – “Development of a catalyst/sorbent for methane reforming” (co-PI, T.D. Wheelock), USDOE, \$200,000, 10/04-12/08.
27. PI – “Enhanced Recovery of Sugars from Corn Fiber and Distillers Dry Grains – Iowa Biotechnology Byproducts Consortium,” (co-PI, S. Larsen, L.A. Johnson, C.E. Glatz), USDA, \$190,000, 8/04-7/08.
28. PI – “Styrene Catalysts: Fundamentals of Operation at Low S/O Ratios,” CRI Catalyst Company, \$200,000, 1/05-12/08.
29. PI – “Design of Nanostructured Organic-Inorganic Hybrid Catalysts for Biorenewable Conversion,” (co-PI, B.D. Chandler), NSF, \$305,000, 4/05-3/09.
30. PI – “Catalytic Upgrading of Bio-Oil,” ConocoPhillips, \$260,974, 5/07-12/09.
31. PI – “Condensed Phase Catalysis with Bio-Oil Species,” ConocoPhillips, \$145,000, 1/08-12/09.
32. co-PI – “Technology Development in Support of Iowa's Bioeconomy,” (PI, R.C. Brown, co-PIs, T. Heindel, T. Bobik, B. Nikolau), Iowa Board of Regents, \$1,300,000, 10/06-9/10.
33. Participant – “Environmental Enhancement through Cornstover Utilization,” (PI, R.C. Brown), USDA, \$1,853,966, 8/06-3/10.
34. Participant – “REU Site in Biological Materials and Processes (BioMaP),” (PI, B. Narasimhan; Participant, C.E. Glatz, M.H. Lamm, S. Mallapragada, P.J. Reilly, J.V. Shanks, R.D. Vigil), NSF, \$370,639, 5/06-4/09.
35. co-PI – “A Systems Approach to Bio-Oil Stabilization,” (PI, R.C. Brown, co-PIs, T. Meyer, R.O. Fox, S. Subramaniam), USDOE, \$1,500,000, 10/08-9/11.
36. PI, Primary Product Distribution from Biomass Fast Pyrolysis, (co-PI, R.C. Brown), ConocoPhillips, \$127,998, 1/1/11-12/21/11.
37. Participant – “REU Site in Biological Materials and Processes (BioMaP),” (PIs, B. Narasimhan, M.H. Lamm; Participant, C.E. Glatz, S. Mallapragada, P.J. Reilly, J.V. Shanks, R.D. Vigil, I.C. Schneider), NSF, \$370,639, 5/09-4/12.
38. co-PI at ISU – “National Advanced Biofuels Consortium,” (Prime – NREL/PNNL), USDOE, \$2,250,000 (ISU portion), 1/10-12/13.

39. PI - Products from HMF, Chevron Phillips, \$60,000, 12/10-6/13.
40. PI - Catalytic Pyrolysis (Prime – MIT), BP, \$127,460, 4/12-12/13.
41. co-PI – “SBIR Phase 1: Green Solvent-Enabled Synthesis of Biobased Furans,” (PI, V. Gonzalez, co-PIs, D.M. Alonso, J.A. Dumesic), NSF, \$150,000, 7/1/13-12/31/13.
42. co-PI – “PIRE: Molecular Engineering for Conversion of Biomass-derived Reactants to Fuels, Chemicals and Materials,” (PI, A. Dayte, co-PIs, R.J. Davis, J.A. Dumesic, M. Neurock), NSF, \$2,500,000, 8/07-7/15.
43. co-PI – “Leading the Bioeconomy,” (co-PI, R.C. Brown), State of Iowa, \$7,500,000, 7/1/13-6/30/15.
44. PI – “Selective Dehydration of Multifunctional Substrates,” USDA NCAUR, \$150,000, 9/12-8/16.
45. PI – “Vapor phase removal of organic acids,” Exxon Mobil, \$200,000, 8/1/14-7/31/16.
46. co-PI – “CREST Partnership Supplement: Directing Polyol Dehydration via Metal Catalysis,” (PI, G.A. Kraus), NSF, \$45,000, 3/16-12/16.

Thesis Research Directed

Doctoral Theses

Weihua Deng “Synthesis and Characterization of Mesoporous Alumina Molecular Sieves” (2004).

Sipho C. Ndlela “The Role of Reduction in the Deactivation of Potassium-Promoted Iron Oxide Dehydrogenation Catalysts” (2004).

Daniel G. Lahr “Mechanistic Insight into the Production of Ethylene Glycol and Propylene Glycol from Biorenewable Resources” (2005).

Isa K. Mbaraka “Design of Catalytic Domains within Organosulfonic Acid-Functionalized Mesoporous Silica” (2005).

Jason A. Bootsma “Recovery of Monosaccharides via Catalytic Hydrolysis” (2006).

Karl O. Albrecht (co-advised) “Development and Testing of a Combined Catalyst/Sorbent Core-on-shell Material for the Production of High Concentration Hydrogen” (2008).

Sarah L. Hruby “Catalytic Domains in Porous Catalysts” (2009).

Zheng Li “Phase Behavior of Iron Oxide Doping with Ethylbenzene Dehydrogenation Promoters” (2009).

Sikander Hakim “Synthesis, Characterization and Applications of Metal Oxides with Hierarchical Nanoporous Structure” (2009).

Basak Cinlar “Acid Catalyzed Carbohydrate Degradation and Dehydration” (2010).

Pushkaraj R. Patwardhan (co-advised) “Understanding the Product Distribution from Biomass Fast Pyrolysis” (2010).

Pedro J. Ortiz-Toral (co-advised) “Steam reforming of water-soluble fast pyrolysis bio-oil: Studies on bio-oil composition, carbon deposition and catalyst modifications” (2011).

Keenan L. Deutsch “Copper catalysts in the C-O hydrogenolysis of biorenewable compounds” (2012).

Ryan W. Snell “Carbon-carbon bond forming reactions for bio-oil upgrading: heterogeneous catalyst and model compound studies” (2012).

Jason M. Anderson “Hydrothermally stable heterogeneous catalysts for biorenewable-derived molecule conversions to chemicals” (2014).

Tianfu Wang “Catalytic Conversion of Glucose to 5-Hydroxymethyl Furfural as a Potential Biorenewable Platform Chemical” (2014).

Michael R. Nolan “Selective dehydration of polyols over solid acids and metal-acid bifunctional catalysts: Towards a catalytic toolbox for rational catalyst design” (2014).

Jing Zhang “Understanding Fast Pyrolysis of Biomass” (2014).

Yong S. Choi “A Manipulation of Pyrolysis Reaction Pathways for Selective Bio-oil Composition” (2015).

Michael W. Nolte “*In Situ* and *Ex Situ* Catalysis in Biomass Fast Pyrolysis” (2016).

Master Theses

Weihua Deng “Characterization and Macroscale Morphology Control of Mesoporous Alumina Molecular Sieves” (2001).

Sipho C. Ndlela “Characterization of Potassium Promoted Iron Oxide Catalysts” (2001).

Janice M. Velazquez “Conversion of Corn Oil to Alkyl Esters” (2007).

Pedro J. Ortiz (co-advised) “Steam Reforming of Bio-Oil: Effect of Bio-Oil Composition and Stability” (2008).

Dursun C. Ozcan (co-advised) “Development of a Sorbent for Carbon Dioxide” (2010).

Jing Zhang “Fast Pyrolysis Behavior of Different Celluloses and Lignocellulosic Biopolymer Interaction during Fast Pyrolysis” (2012).

Anita N. Bejile “Copper-Based Catalysts in the Selective Dehydration of Polyols” (2015).

Books Co-Authored, Book Chapters and Other Publications:

1. Van Gerpen, J., Pruszko, R., Clements, D., Shanks, B., and Knothe, G. “Building a Successful Biodiesel Business,” Biodiesel Basics, ISBN 0-9786349-0-X (2005 1st ed., 2006 2nd ed.).
2. Shanks, B.H., "Design of Heterogeneous Catalysts for the Conversion of Biorenewable Feedstocks" in Catalysis for the Conversion of Biomass and Its Derivatives, Behrens, M. and Datye, A.K. eds., Max Planck Research Library, Germany, ISBN: 9783844242829, 349-396 (2013).

Refereed Publications:

1. Shanks, B.H. and Berglund, K.A., “Contact Nucleation from Aqueous Sucrose Solutions,” *AIChE J.*, **31**, 152 (1985).
2. Shanks, B.H. and Bailey, J.E., “Experimental Investigations using Feedback-Induced Bifurcation: Carbon Monoxide Oxidation over Supported Silver,” *Chem. Eng. Commun.*, **61**, 127 (1987).
3. Shanks, B.H. and Bailey, J.E., “Modeling of Slow Dynamics in the Oxidation of CO over Supported Silver,” *AIChE J.*, **33**, 1971 (1987).
4. Shanks, B.H., Prairie, M.R., and Bailey, J.E., “Experimental Investigation of Entrainment Phenomena in a Periodically Forced, Autonomously Oscillating Process,” *Chem. Eng. Commun.*, **57**, 189 (1987).
5. Shanks, B.H. and Bailey, J.E., “Autonomous Oscillations in Carbon Monoxide Oxidation over Supported Rhodium,” *J. Catal.*, **110**, 197 (1988).

6. Prairie, M.R., Shanks, B.H. and Bailey, J.E., "Intentional Manipulation of Closed-Loop Time Delay for Model Validation using Feedback-Induced Bifurcation," *Chem. Eng. Sci.*, **44**, 161 (1989).
7. Shanks, B.H. and Bailey, J.E., "Application of the Feedback-Induced Bifurcation Method to a Catalytic Reaction System," *Chem. Eng. Sci.*, **44**, 901 (1989).
8. Cho, B.K., Shanks, B.H., and Bailey, J.E., "Kinetics of NO Reduction by CO over Supported Rhodium Catalysts: Isotopic Cycling Experiments," *J. Catal.*, **115**, 486 (1989).
9. Deng, W., Bodart, P., Pruski, M., and Shanks, B.H., "Characterization of Mesoporous Alumina Molecular Sieves Synthesized by Nonionic Templating," *Microporous Mesoporous Mater.*, **52**, 169-177 (2002).
10. Lin, V. S.-Y., Radu, D.R., Han, M.-K., Deng, W., Kuroki, S., Shanks, B.H., and Pruski, M., "Oxidative Polymerization of 1,4-Diethynylbenzene into Highly Conjugated Poly(phenylene butadiynylene) Within the Channels of Surface-Functionalized Mesoporous Silica and Alumina Materials," *J. Am. Chem. Soc.*, **124**, 9040-9041 (2002).
11. Deng, W., Toepke, M.W., and Shanks, B.H., "Surfactant-Assisted Synthesis of Aluminas with Hierarchical Nanopores," *Adv. Func. Mater.*, **13**, 61-65 (2003).
12. Ndllela, S.C. and Shanks, B.H., "Reducibility of Potassium-Promoted Iron Oxide under Hydrogen Conditions," *Ind. Eng. Chem. Res.*, **42**, 2112-2121 (2003).
13. Mbaraka, I.K., Radu, D.R., Lin, V. S.-Y., and Shanks, B.H., "Organosulfonic Acid Functionalized Mesoporous Silicas for the Esterification of Fatty Acid," *J. Catal.*, **219**, 329-336 (2003).
14. Lahr, D.G. and Shanks, B.H., "Kinetic Analysis of the Hydrogenolysis of Lower Polyhydric Alcohols: Glycerol to Glycols," *Ind. Eng. Chem. Res.*, **42**, 5467-5472 (2003).
15. Bootsma, J.A. and Shanks, B.H., "Hydrolysis Characteristics of the Tissue Fractions Resulting from Mechanical Separation of Corn Stover," *Appl. Biochem. Biotechnol.*, **125**, 27-39 (2005).
16. Mbaraka, I.K. and Shanks, B.H., "Design of Multifunctionalized Mesoporous Silicas for Fatty Acid Esterification," *J. Catal.*, **229**, 365-373 (2005).
17. Satrio, J.A., Shanks, B.H. and Wheelock, T.D., "Development of a Novel Combined Catalyst and Sorbent for Hydrocarbon Reforming," *Ind. Eng. Chem. Res.*, **42**, 3901-3911 (2005).
18. Lahr, D.G. and Shanks, B.H., "Effect of Sulfur and Temperature on Ruthenium Catalyzed Glycerol Hydrogenolysis to Glycols," *J. Catal.*, **232**, 386-394 (2005).

19. Deng, W. and Shanks, B.H., "Synthesis of Hierarchically Structured Aluminas under Controlled Hydrodynamic Conditions," *Chem. Mater.*, **17**, 3092-3100 (2005).
20. Mbaraka, I.K. and Shanks, B.H., "Conversion of Oils and Fats using Advanced Mesoporous Heterogeneous Catalysts," *J. Am. Oil Chem. Soc.*, **83**, 79-91 (2006).
21. Mbaraka, I.K., McGuire, K.J. and Shanks, B.H., "Acidic Mesoporous Silica for the Catalytic Conversion of Fatty Acids in Beef Tallow," *Ind. Eng. Chem. Res.*, **45**, 3022-3028 (2006).
22. Jackson, M.A., Mbaraka, I.K. and Shanks, B.H., "Esterification of Oleic Acid in Supercritical Carbon Dioxide Catalyzed by Functionalized Mesoporous Silica and an Immobilized Lipase," *Appl. Catal. A: Gen.*, **310**, 48-53 (2006).
23. Ndlela, S.C. and Shanks, B.H., "Reduction Behavior of Potassium-Promoted Iron Oxide under Mixed Steam/Hydrogen Atmospheres," *Ind. Eng. Chem. Res.*, **45**, 7427-7434 (2006).
24. Mbaraka, I.K. and Shanks, B.H., "Acid Strength Variation Due to Spatial Location of Organosulfonic Acid Groups in Mesoporous Silica," *J. Catal.*, **244**, 78-85 (2006).
25. Satrio, J.A., Shanks, B.H. and Wheelock, T.D., "A Combined Catalyst and Sorbent for Enhancing Hydrogen Production from Coal or Biomass," *Energy Fuels*, **21**, 322-326 (2007).
26. Shanks, B.H., "Unleashing Biocatalysis/Chemical Catalysis Synergies for Efficient Biomass Conversion," *ACS Chem. Biol.*, **2**, 533-535 (2007).
27. Bootsma, J.A. and Shanks, B.H., "Cellobiose Hydrolysis Using Organic-Inorganic Hybrid Mesoporous Silica Catalysts," *Appl. Catal. A: Gen.*, **327**, 44-51 (2007).
28. Kanthasamy, R., Mbaraka, I.K., Shanks, B.H. and Larsen, S.C., "Solid-State MAS NMR Studies of Sulfonic Acid-Functionalized SBA-15," *Appl. Magnetic Resonance*, **32**, 513-526 (2007).
29. Bootsma, J.A., Entorf, M., Eder, J. and Shanks, B.H., "Hydrolysis of Oligosaccharides from Distillers Grains Using an Organosulfonic Acid-Functionalized Mesoporous Silica Catalyst," *Bioresource Technol.*, **99**, 5226-5231 (2008).
30. Ladisch, M., Dale, B., Tyner, W., Mosier, N., Kim, Y., Cotta, M., Dien, B., Blaschek, H., Laurenas, E., Shanks, B., Verkade, J., Schell, C. and Peterson, G., "Cellulose Conversion in Dry Grind Ethanol Plants," *Bioresource Technol.*, **99**, 5157-5159 (2008).
31. Nikolau, B.J., Perera, A.D.N., Brachova, L. and Shanks, B., "Platform biochemicals for a biorenewable chemical industry," *Plant J.*, **54**, 536-545 (2008).

32. Zhu, H., Shanks, B.H., and Heindel, T.J., "Enhancing CO-water mass transfer by functionalized MCM41 nanoparticles," *Ind. Eng. Chem. Res.*, **47**, 7881-7887 (2008).
33. Van Gerpen, J., Gray, A., and Shanks, B.H., "Convergence of Agriculture and Energy: III. Considerations in Biodiesel Production" *CAST Commentary*, QTA2008-2 (2008).
34. Albrecht, K.O., Wagenbach, K.S., Satrio, J.A., Shanks, B.H., and Wheelock, T.D., "Development of a CaO-Based CO₂ Sorbent with Improved Cyclic Stability," *Ind. Eng. Chem. Res.*, **47**, 7841-7848 (2008).
35. Li, Z. and Shanks, B.H., "Stability and Phase Transformations of Potassium Promoted Iron Oxide in Various Gas Phase Environments," *Appl. Catal. A: Gen.*, **354**, 50-56 (2009).
36. Zhu, H., Shanks, B.H., and Heindel, T.J., "Effect of electrolytes on CO-water mass transfer," *Ind. Eng. Chem. Res.*, **48**, 3206-3210 (2009).
37. Hruby, S.L. and Shanks, B.H., "Acid-Base Cooperativity in Condensation Reactions with Functionalized Mesoporous Silica Catalysts," *J. Catal.*, **263**, 181-188 (2009).
38. Miao, S. and Shanks, B.H., "Esterification of Biomass Pyrolysis Model Acids over Sulfonic Acid-Functionalized Mesoporous Silicas," *Appl. Catal. A: Gen.*, **359**, 113-120 (2009).
39. Hakim, S. and Shanks, B.H., "A Comparative Study of Macroporous Metal Oxides Synthesized via a Unified Approach," *Chem. Mater.*, **21**, 2027-2038 (2009).
40. Lohitharn, N. and Shanks, B.H., "Upgrading of Bio-oil: Effect of Light Aldehydes on Acetic Acid Removal via Esterification," *Catal. Commun.*, **11**, 96-99 (2009).
41. Scruggs, B.A., Kilgore, S.L., Hruby, S.L., Shanks, B.H., Chandler, B.D., "Preparation and Characterization of Supported Amine Catalysts," *Catalysis of Organic Reactions*, **123**, 339-344 (2009).
42. Patwardhan, P.R., Satrio, J.A., Brown, R.C., and Shanks, B.H., "Product Distribution from Fast Pyrolysis of Carbohydrates," *J. Anal. Appl. Pyrolysis*, **86**, 323-330 (2009).
43. Zhu, H., Shanks, B.H., Choi, D.W., and Heindel, T.J., "Effect of functionalized MCM41 nanoparticles on syngas fermentation," *Biomass Bioenergy*, **34**, 1624-1627 (2010).
44. Tang, Y., Miao, S., Shanks, B.H., and Zheng, X., "Bifunctional Mesoporous Organic-Inorganic Hybrid Silica for Combined One-step Hydrogenation Esterification," *Appl. Catal. A: Gen.*, **375**, 310-317 (2010).

45. Patwardhan, P.R., Satrio, J.A., Brown, R.C., and Shanks, B.H., "Influence of inorganic salts on the primary pyrolysis products of cellulose," *Bioresource Technol.*, **101**, 4646-4655 (2010).
46. Ver Meer, M.A., Narasimhan, B., Shanks, B.H. and Mallapragada, S.K., "Effect of mesoporosity on thermal and mechanical properties of polystyrene/silica composites," *ACS Appl. Mater. & Interfaces*, **2**, 41-47 (2010).
47. Hakim, S. and Shanks, B.H., "Manipulation of Mesoporous Structure and Crystallinity in Spontaneously Self-Assembled Hierarchical Metal Oxides," *Microporous Mesoporous Mater.*, **135**, 105-115 (2010).
48. Snell, R.W., Combs, E. and Shanks, B.H., "Aldol Condensations using Bio-oil Model Compounds: The Role of Acid-Base Bi-functionality," *Catal. Today*, **53**, 1248-1253 (2010).
49. Albrecht, K.O., Satrio, J.A., Shanks, B.H., and Wheelock, T.D., "The Application of a Combined Catalyst and Sorbent for Steam Reforming of Methane," *Ind. Eng. Chem. Res.*, **49**, 4091-4098 (2010).
50. Shanks, B.H., "Conversion of Biorenewable Feedstocks: New Challenges in Heterogeneous Catalysis," *Ind. Eng. Chem. Res.*, **49**, 10212-10217 (2010).
51. Dapsens, P.Y., Hakim, S., Su, B.-L., and Shanks, B.H., "Direct Observation of Macropore Self-Formation in Hierarchically Structured Metal Oxides," *Chem. Comm.*, **46**, 8980-8982 (2010).
52. Degirmenci, V., Cinlar, B., Yilmaz, A., van Santen, R.A., Shanks, B.H., Hensen, E.J.M., and Uner, D., "Sulfated zirconia modified SBA-15 catalysts for cellobiose hydrolysis," *Catal. Lett.*, **141**, 33-42 (2011).
53. Miao, S. and Shanks, B.H., "On the Mechanism of Acetic Acid Esterification over Sulfonic Acid Functionalized Mesoporous Silica," *J. Catal.*, **279**, 136-143 (2011).
54. Patwardhan, P.R., Dalluge, D.L., Shanks, B.H., and Brown, R.C., "Distinguishing Primary and Secondary Pyrolysis Pathways of Cellulose," *Bioresource Technol.*, **102**, 5265-5269 (2011).
55. Cinlar, B. and Shanks, B.H., "Characterization of the Acidic Sites in Organic Acid Functionalized Mesoporous Silica in the Aqueous Phase," *Appl. Catal. A: Gen.*, **396**, 76-84 (2011).
56. Hakim, S.H. and Shanks, B.H., "Synthesis and Characterization of Hierarchically Structured Aluminosilicates," *J. Mater. Chem.* **21**, 7364-7375 (2011).

57. Ozcan, D.O., Shanks, B.H., and Wheelock, T.D., "Improving the Stability of a CaO-Based Sorbent for CO₂ by Thermal Pretreatment," *Ind. Eng. Chem. Res.*, **50**, 6933-6942 (2011).
58. Patwardhan, P.R., Brown, R.C., and Shanks, B.H., "Product Distribution from the Fast Pyrolysis of Hemicellulose," *ChemSusChem*, **4**, 636-643 (2011).
59. Ortiz-Toral, P.J., Satrio, J., Brown, R.C., and Shanks, B.H., "Steam Reforming of Bio-oil Fractions: Effect of Composition and Stability," *Energy Fuels*, **25**, 3289-3297 (2011).
60. Tang, Y., Miao, S., Pham, H.N., Datye, A., Zheng, X., and Shanks, B.H., "Enhancement of Pt/SBA15 Catalytic Activity in the Hydrogenation of Aldehydes," *Appl. Catal. A: Gen.*, **406**, 81-88 (2011).
61. Li, Z. and Shanks, B.H., "Role of Cr and V on the Stability of Potassium-Promoted Iron Oxides used as Catalysts in Ethylbenzene Dehydrogenation," *Appl. Catal. A: Gen.*, **405**, 101-107 (2011).
62. Patwardhan, P.R., Brown, R.C., and Shanks, B.H., "Characterizing the Fast Pyrolysis of Lignin," *ChemSusChem* **4**, 1629-1636 (2011).
63. Deutsch, K.L. and Shanks, B.H., "Active Species of Copper Chromite Catalyst in C-O Hydrogenolysis of 5-Methylfurfuryl Alcohol," *J. Catal.*, **285**, 235-241 (2012).
64. Pagan-Torres, Y.J., Wang, T., Gallo, J.M.R., Shanks, B.H., and Dumesic, J.A., "Production of 5-Hydroxymethylfurfural from Glucose Using a Combination of Lewis and Brønsted Acid Catalysts in Water in a Biphasic Reactor with an Alkylphenol Solvent," *ACS Catal.*, **2**, 930-934 (2012).
65. Fu, J., Hakim, S.H. and Shanks, B.H., "Aqueous-Phase Processing of Bio-oil Model Compounds over Pt-Re Supported on Carbon," *Top. Catal.*, **55**, 140-147 (2012).
66. Wang, T., Combs, E., Pagan-Torres, Y.J., Dumesic, J.A., and Shanks, B.H., "Water-compatible Lewis acid-catalyzed conversion of carbohydrates to 5-hydroxymethylfurfural in a biphasic solvent system," *Top. Catal.*, **55**, 657-662 (2012).
67. Deutsch, K.L., Lahr, D.G., and Shanks, B.H., "Probing the ruthenium-catalyzed higher polyol hydrogenolysis reaction through the use of stereoisomers," *Green Chem.*, **14**, 1635-1642 (2012).
68. Chia, M., Schwartz, T.J., Shanks, B.H., and Dumesic, J.A., "Triacetic Acid Lactone as a Biorenewable Platform Chemical," *Green Chem.*, **14**, 1850-1853 (2012).
69. Deutsch, K.L. and Shanks, B.H., "Hydrodeoxygenation of Lignin Model Compounds over a Copper Catalyst," *Appl. Catal. A: Gen.*, **447**, 144-150 (2012).

70. Snell, R.W. and Shanks, B.H., "Ceria Calcination Temperature Influence on Acetic Acid Ketonization: Mechanistic Insights," *Appl. Catal. A: Gen.*, **451**, 86-93 (2013).
71. Combs, E., Cinlar, B., Pagan-Torres, Y.J., Dumesic, J.A., and Shanks, B.H., "Influence of Alkali and Alkaline Earth Metal Salts on Glucose Conversion to 5-Hydroxymethylfurfural in an Aqueous System," *Catal. Commun.*, **30**, 1-4 (2013).
72. Cinlar, B., Wang, T., and Shanks, B.H., "Kinetics of Monosaccharide Conversion in the Presence of Homogeneous Acids," *Appl. Catal. A: Gen.*, **450**, 237-242 (2013).
73. Snell, R.W. and Shanks, B.H., "Insights into the ceria-catalyzed ketonization reaction mechanism for biofuels applications," *ACS Catal.*, **3**, 783-789 (2013).
74. Xiong, H., Wang, T., Shanks, B.H., and Datye, A.K., "Tuning the location of niobia/carbon composites in a biphasic reaction: dehydration of D-glucose to 5-hydroxymethylfurfural," *Catal. Lett.* **143**, 509-516 (2013).
75. Hakim, S.H., Shanks, B.H., and Dumesic, J.A., "Catalytic upgrading of the light fraction of a simulated bio-oil over CeZrO_x catalyst," *Appl. Catal. B: Environ.*, **142**, 368-376 (2013).
76. Tang, Y., Miao, S., Mo, L., Zheng, X., and Shanks, B.H., "One-step Hydrogenation/Esterification Activity Enhancement over Bifunctional Mesoporous Organic-Inorganic Hybrid Silicas," *Top. Catal.*, **56**, 1804-1813 (2013).
77. Snell, R.W., Hakim, S.H., Dumesic, J.A., and Shanks, B.H., "Catalysis with ceria nanocrystals: bio-oil model compound ketonization," *Appl. Catal. A: Gen.*, **464**, 288-296 (2013).
78. Johnson, R.L., Anderson, J., Shanks, B.H., Fang, X., Hong, M., Schmidt-Rohr, K., "Spectrally Edited 2D ¹³C-¹³C NMR Spectra without Diagonal Ridge for Characterizing ¹³C-Enriched Low-Temperature Carbon Materials," *J. Magn. Reson.*, **234**, 112-124 (2013).
79. Wang, T., Nolte, M.W. and Shanks, B.H., "Catalytic Dehydration of C₆ Carbohydrates for the Production of 5-Hydroxymethylfurfural (HMF): A Versatile Platform Chemical," *Green Chem.*, **16**, 548-572 (2014).
80. Deutsch, K.L. and Shanks, B.H., "Copper Mixed Metal Oxide Catalysts in the Hydrogenolysis of 5-Methylfurfuryl Alcohol," *Appl. Catal. A: Gen.*, **470**, 390-397 (2014).
81. Xiong, H., Nolan, M., Shanks, B.H., and Datye, A.K., "Comparison of impregnation and deposition precipitation for the synthesis of hydrothermally stable nobia/carbon," *Appl. Catal. A: Gen.*, **471**, 165-174 (2014).
82. Snell, R.W. and Shanks, B.H., "CeMO_x Promoted Condensed Phase Ketonization of Biomass-derived Carboxylic Acids," *ACS Catal.*, **4**, 512-518 (2014).

83. Bai, X., Brown, R.C., Fu, J., Shanks, B.H., and Kieffer, M.M., "The Influence of Alkali and Alkaline Earth Metals and the Role of Acid Pretreatments in Production of Sugars from Switchgrass Based on Solvent Liquefaction" *Energy Fuels*, **28**, 1111-1120 (2014).
84. Mayes, H.B., Tian, J., Nolte, M.W., Shanks, B.H., Beckham, G.T., Gnanakaran, S. and Broadbelt, L.J., "Sodium ion interactions with aqueous glucose: insights from quantum mechanics, molecular dynamics, and experiment," *J. Phys. Chem. B*, **118**, 1990-1200 (2014).
85. Fu, J., Sun, G. and Shanks, B.H., "Aqueous-Phase Processing of Multi-Functional Compounds over Platinum-Rhenium Supported on Carbon," *Energy Fuels*, **28**, 2123-2128 (2014).
86. Nolan, M.R., Sun, G. and Shanks, B.H., "On the selective acid-catalysed dehydration of 1,2,6-hexanetriol," *Catal. Sci. Technol.*, **4**, 2260-2266 (2014).
87. Anderson, J.M., Johnson, R.L., Schmidt-Rohr, K, and Shanks, B.H., "Hydrothermal Degradation of Model Sulfonic Acid Compounds: Probing the Relative Sulfur–Carbon Bond Strength in Water," *Catal. Commun.*, **51**, 33-36 (2014).
88. Anderson, J.M., Johnson, R.L., Schmidt-Rohr, K, and Shanks, B.H., "Chemical Structure and Hydrothermal Deactivation of Moderate-Temperature Carbon Materials with Acidic SO₃H Sites," *Carbon*, **74**, 333-345 (2014).
89. Kong, M., Albrecht, K.O., Shanks, B.H. and Wheelock, T.D., "Development of a Combined Catalyst and Sorbent for the Water Gas Shift Reaction," *Ind. Eng. Chem. Res.*, **53**, 9570-9577 (2014).
90. Mayes, H.B., Nolte, M.W., Beckham, G.T., Shanks, B.H., and Broadbelt, L.J., "Alpha-Bet(a) of Glucose Pyrolysis: Computational and Experimental Investigations of 5-Hydroxymethylfurfural and Levoglucosan Formation Reveal Implications for Cellulose Pyrolysis," *ACS Sustain. Chem. Eng.*, **4**, 1461-1473 (2014).
91. Schwartz, T.J., O'Neill, B.J., Shanks, B.H., and Dumesic, J.A., "Bridging the chemical and biological catalysis gap: challenges and outlooks for producing sustainable chemicals," *ACS Catal.*, **4**, 2060-2069 (2014).
92. Johnson, R.L., Anderson, J.M, Shanks, B.H. and Schmidt-Rohr, K., "A simple one-step synthesis of polyaromatic materials with high concentrations of stable catalytic sites, validated by NMR," *Chem. Mater.*, **26**, 5523-5529 (2014).
93. Zhou, X., Nolte, M.W., Shanks, B.H. and Broadbelt, L.J., "Experimental and Mechanistic Modeling of Fast Pyrolysis of Neat Glucose-based Carbohydrates. Part 1: Experiments and

- Development of a Detailed Mechanistic Model,” *Ind. Eng. Chem. Res.*, **53**, 13274-13289 (2014).
94. Zhou, X., Nolte, M.W., Shanks, B.H. and Broadbelt, L.J., “Experimental and Mechanistic Modeling of Fast Pyrolysis of Neat Glucose-based Carbohydrates. Part 2: Validation and Evaluation of the Mechanistic Model,” *Ind. Eng. Chem. Res.*, **53**, 13290-13301 (2014).
 95. Zhang, J., Nolte, M.W., and Shanks, B.H., “Investigation of Primary Reactions and Secondary Effects from the Pyrolysis of Different Celluloses,” *ACS Sustain. Chem. Eng.*, **2**, 2820-2830 (2014).
 96. Choi, Y.S., Johnston, P.A., Brown, R.C., Shanks, B.H., and Lee, K.-H., “Detailed Characterization of Red Oak-Derived Pyrolysis Oil; Integrated use of GC, HPLC, IC, GPC and Karl-Fischer,” *J. Anal. Appl. Pyrolysis*, **110**, 147-154 (2014).
 97. Mayes, H.B., Nolte, M.W., Beckham, G.T., Shanks, B.H., and Broadbelt, L.J., “The Alpha-Bet(a) of Salty Glucose Pyrolysis: Computational Investigations of 5-Hydroxymethylfurfural and Levoglucosan Formation Reveal Cellulose Pyrolysis Catalytic Action by Sodium Ions,” *ACS Catal.*, **5**, 192-202 (2015).
 98. Wang, K., Zhang, J., Shanks, B.H., and Brown, R.C., “Catalytic conversion of carbohydrate-derived oxygenates over HZSM-5 in a tandem micro-reactor system,” *Green Chem.* **17**, 557-564 (2015).
 99. Zhang, J., Choi, Y.S., Yoo, C.G., Kim, T.H., Brown, R.C. and Shanks, B.H., “Cellulose-hemicellulose, cellulose-lignin interactions during fast pyrolysis,” *ACS Sustain. Chem. Eng.*, **3**, 293-301 (2015).
 100. Shanks, B.H., “Across the Board: Brent H. Shanks,” *ChemSusChem*, **8**, 928-930 (2015).
 101. Wang, K., Zhang, J., Shanks, B.H. and Brown, R.C., “The deleterious effect of alkali and alkaline earth salts on hydrocarbon yields from catalytic pyrolysis of lignocellulosic biomass and its mitigation,” *Appl. Energy*, **148**, 115-120 (2015).
 102. Wang, T., Glasper, J. and Shanks, B.H., “Kinetics of Glucose Dehydration Catalyzed by Homogeneous Lewis Acidic Metal Salts in Water,” *Appl. Catal. A: Gen.*, **498**, 214-221 (2015).
 103. Qi, J., Benipal, N., Chadderton, D.J., Huo, J., Jiang, Y., Qiu, Y., Han, X., Hu, Y.H. Shanks, B.H. and Li, W., “Carbon nanotubes as catalysts for direct carbonylhydrazide fuel cells,” *Carbon*, **89**, 142-147 (2015).
 104. Gardner, D.G., Huo, J., Hoff, T.C., Johnson, R.L., Shanks, B.H., Tessonier, J.-P., “Insights into the Hydrothermal Stability of ZSM-5 under Relevant Biomass Conversion Reaction Conditions,” *ACS Catal.*, **5**, 4418-4422 (2015).

105. Choi, Y.S., Lee, K.-H., Zhang, J., Brown, R.C., and Shanks, B.H., "Manipulation of chemical species in bio-oil using in situ catalytic fast pyrolysis in both a bench-scale fluidized bed pyrolyzer and micropyrolyzer," *Biomass Bioenergy*, **81**, 256-264 (2015).
106. Zhang, J., Choi, Y.S., and Shanks, B.H., "Tailoring the composition of bio-oil by vapor-phase removal of organic acids," *ChemSusChem*, **8**, 4256-4265 (2015).
107. Zhou, X., Nolte, M.W., Mayes, H.B., Shanks, B.H. and Broadbelt, L.J., "Experimental and Mechanistic Modeling of Fast Pyrolysis of Glucose-Based Carbohydrates in the Presence of NaCl Part 1: Experiments and Development of a Mechanistic Model," *AIChE J*, **62**, 766-777 (2016).
108. Zhou, X., Nolte, M.W., Mayes, H.B., Shanks, B.H. and Broadbelt, L.J., "Experimental and Mechanistic Modeling of Fast Pyrolysis of Glucose-Based Carbohydrates in the Presence of NaCl Part 2: Validation and Evaluation of the Mechanistic Model," *AIChE J*, **62**, 778-791 (2016).
109. Nolan, M.R., Bejile, A., Enombo, S.-L., and Shanks, B.H., "Directing polyol dehydration via modification of acid catalysts with metals," *Top. Catal.*, **59**, 29-36 (2016).
110. Nolte, M.W., Zhang, J. and Shanks, B.H., "Ex Situ Hydrodeoxygenation in Biomass Pyrolysis using Molybdenum Oxide and Low Pressure Hydrogen," *Green Chem.*, **18**, 134-138 (2016).
111. Qiu, Y., Huo, J., Shanks, B.H. and Li, W., "N- and S- doped mesoporous carbon as metal-free cathode catalysts for direct biorenewable alcohol fuel cell," *J. Mater. Chem. A*, **4**, 83-95 (2016).
112. Johnson, R.L., Perras, F.A., Schwartz, T.J., Dumesic, J.A., Shanks, B., and Pruski, M., "Identifying Low-Coverage Surface Species on Noble Metal Nanoparticles by DNP-NMR" *Chem. Commun.*, **52**, 1859-1862 (2016).
113. Choi, Y.S., Singh, R., Zhang, J., Balasubramanian, G., Sturgeon, M.R., Katahira, R., Chupka, G., Beckham, G.T. and Shanks, B.H., "Pyrolysis reaction networks for lignin model compounds: Unraveling thermal deconstruction of β -O-4 and α -O-4 compounds," *Green Chem.*, **18**, 1762-1773 (2016).
114. Schwartz, T.J., Shanks, B.H., and Dumesic, J.A., "Coupling chemical and biological catalysis: A flexible paradigm for producing biobased chemicals," *Curr. Opin. Biotechnol.* **38**, 54-62 (2016).
115. Wang, T., Ide, M.S., Nolan, M.R., Davis, R.J. and Shanks, B.H., "Renewable Production of Nylon-6,6 Monomers from Biomass-derived 5-Hydroxymethylfurfural (HMF)," *Energy Environ. Focus*, **5**, 13-17 (2016).

116. Zhang, J., Wang, K., Nolte, M.W., Choi, Y.S., Brown, R.C., and Shanks, B.H., "Catalytic Deoxygenation of Bio-oil Model Compounds over Acid-Base Bifunctional Catalysts," *ACS Catal.*, **6**, 2608-2621 (2016).
117. Zhang, J., Choi, Y.S., and Shanks, B.H., "Catalytic deoxygenation during cellulose fast pyrolysis using acid-base bifunctional catalysis," *Catal. Sci. Technol.*, **6**, 7468-7476 (2016).
118. Nolte, M.W. and Shanks, B.H., "A Perspective on Catalytic Strategies for Deoxygenation of Biomass Pyrolysis Products," *Energy Technol.*, **5**, 7-18 (2017).
119. Perras, F.A., Padmos, J.M., Johnson, R.L., Wang, L.L. Schwartz, T.J., Kobayashi, T., Horton, J.H., Dumesic, J.A., Shanks, B.H., Johnson, D.D., and Pruski, M., "Characterizing Substrate-Surface Interactions on Alumina-Supported Metal Catalysts by DNP-Enhanced Double-Resonance NMR Spectroscopy," *J. Am. Chem. Soc.*, **139**, 2702-2709 (2017).
120. Pfennig, T., Johnson, R.L., and Shanks, B.H. "The formation of p-toluic acid from coumalic acid: A reaction network analysis," *Green Chem.*, **19**, 3263-3271 (2017).
121. Shanks, B.H. and Keeling, P.L., "Bioprivileged Molecules: Creating Value from Biomass," *featured cover*, *Green Chem.*, **19**, 3177-3185 (2017).
122. Carraher, J.M., Pfennig, T., Rao, R.G., Shanks, B.H., Tessonnier, J.-P., "cis,cis-Muconic acid isomerization and catalytic conversion to biobased cyclic-C₆-1,4-diacid monomers," *Green Chem.*, **19**, 3042-3050 (2017).
123. Zhang, J., Kim, K.H., Choi, Y.S., Motagamwala, A.H., Dumesic, J.A., Brown, R.C., and Shanks, B.H., "Comparison of fast pyrolysis behavior of cornstover lignins isolated by different methods," *ACS Sustain. Chem. Eng.*, **5**, 5657-5661 (2017).
124. Nolte, M.W., Saraeian, A., and Shanks, B.H., "Hydrodeoxygenation of Cellulose Pyrolysis Model Compounds using Molybdenum Oxide and Low Pressure Hydrogen," *Green Chem.*, **19**, 3654-3664 (2017).
125. Johnson, R.L., Hanrahan, M.P., Mellmer, M., Dumesic, J.A., Rossini, A.J., and Shanks, B.H., "The Solvent-Solid Interface of Acid Catalysts Studied by High Resolution MAS NMR," *J. Phys. Chem. C*, **121**, 17226-17234 (2017).
126. Pfennig, T., Carraher, J., Chemburkar, A., Johnson, R.L., Anderson, A., Tessonnier, J.-P., Neurock, M., and Shanks, B.H. "A new selective route towards benzoic acid and derivatives from biomass-derived coumalic acid," *Green Chem.*, **19**, 4879-4888 (2017).
127. Huo, J., Johnson, R.L., Duan, P., Pham, H.N., Mendivelso-Perez, D., Smith, E.A., Datye, A.K., Schmidt-Rohr, K., and Shanks, B.H., "Stability of Pd Nanoparticles on Carbon-Coated Supports under Hydrothermal Conditions," *Catal. Sci. Technol.* submitted (2017).

128. Matthiesen, J.E. Abdolmohammadi, S., Chadderdon, D.J., Chadderdon, X.H., Carraher, J.M., Johnson, R.L., Cochran, E.W., Shanks, B.H., Li, W., Tessonier, J.-P., "Elucidating the Electrochemical and Electrocatalytic Pathways for the Selective Hydrogenation of Biobased Platform Chemicals," *ACS Catal.*, submitted (2017).
129. Dalluge, D., Choi, Y.S., Shanks, B.H., and Brown, R.C., "Comparison of Direct and Indirect Contact Heat Exchange in Levoglucosan Recovery from Cellulose Fast Pyrolysis," *Appl. Energy*, submitted (2017).

Conference Proceedings:

1. Lahr, D. and Shanks, B.H., "The Role of Sulfur Modification on Ruthenium Catalysts used in Glycol Production from Glycerol," Topical Conference: Envisioning Biorefineries, *AIChE Annual Meeting*, November (2003).
2. Bootsma, J.A. and Shanks, B.H., "Hydrolysis of Corn Stover Pith and Fiber Fractions Resulting from Mechanical Separation," Topical Conference: Envisioning Biorefineries, *AIChE Annual Meeting*, November (2003).
3. Satrio, J.A., Shanks, B.H. and Wheelock, T.D., "Development of A Combined Catalyst and Sorbent for Methane Reforming," Topical Conference: Fuel Cell Technology, *AIChE Annual Meeting*, November (2003).
4. Shanks, B.H., "Catalytic Hydrolysis of Oligosaccharides Released from Thermal Treatment of Corn Fiber," *Corn Utilization & Technology Conference*, June (2004).
5. Satrio, J.A., Shanks, B.H. and Wheelock, T.D., "A combined catalyst and sorbent for enhancing hydrogen production from coal," *Proceedings of the International Technical Conference on Coal Utilization & Fuel Systems*, **30** (1), 331-341 (2005).
6. Zhu, H., Shanks, B.H. and Heindel, T.J., "Enhancing CO-water mass transfer with MCM41 nanoparticles and electrolytes," *AIChE Annual Meeting*, 34/1-34/3 (2008).
7. Patwardhan, P.R., Johnston, P.A., Brown, R.C. and Shanks, B.H., "Understanding fast pyrolysis of lignin," *American Chemical Society*, **55**, 104-105 (2010).
8. Shanks, B.H., "Thermal removal of oxygen from biomass for fuels production," *American Chemical Society*, **56**, 54 (2011).
9. Shanks, B.H., "Thermal deconstruction of lignocellulosic biomass," *American Chemical Society*, **57**, 458 (2012).

10. Mayes, H.B., Zhang, J., Shanks, B.H., and Broadbelt, L.J., "Sodium-mediated glucose pyrolysis: experimental results and mechanistic dehydration study" *American Chemical Society*, **57**, 617-619 (2012).
11. Dalluge, D.L., Choi, Y.S., Shanks, B.H., and Brown, R.C., "Development of a cold-quench bio-oil separation system and its effect on cellulose bio-oil yield and composition," *AIChE Annual Meeting*, Conference Proceedings (2012).

Patents:

1. Milam, S.N. and Shanks, B.H., "Restructured Iron Oxide for Use in Iron Oxide Catalysts," United States Patent, **5,668,075**.
2. Milam, S.N. and Shanks, B.H., "Dehydrogenation Catalyst and Process," United States Patent, **5,962,757**.
3. Wheelock, T.D. and Shanks, B.H., "Catalyst and Sorbent Material for the Production of Hydrogen," United States Patent, **7,176,159**.
4. Dumesic, J.A., Pagan-Torres, Y.J., Wang, T., and Shanks, B.H., "Lewis and Bronsted-Lowry Acid-Catalyzed Production of 5-Hydroxymethylfurfural (HMF) from Glucose," United States Patent, **8,642,791**.
5. Johnson, R.L., Anderson, J.M., Schmidt-Rohr, K., and Shanks, B.H., "Functionalized Carbon Matrix Materials," United States Patent application, 20150239918, (2015).
6. Tessonier, J.P., Carraher, J.M., Pfennig, T., and Shanks, B.H., "Isomerization of Muconic Acid," United States Patent application, (2016).
7. Tessonier, J.P., Matthiesen, J.E., Pfennig, T., Shanks, B.H. and Carraher, J.M., "Electrochemical Isomerization of Muconic Acid," United States Patent application, (2016).

Invited Presentations:

1. "Industrial Catalyst Development: Ethylbenzene Dehydrogenation Catalysts," University of Iowa, Department of Chemical and Biochemical Engineering, November, 1998.
2. "Industrial Catalyst Development: Ethylbenzene Dehydrogenation Catalysts," Iowa State University, Department of Chemical Engineering, December, 1998.
3. "Industrial Catalyst Research and Development: A Case Study with Dehydrogenation Catalysts," Iowa State University, Department of Chemistry, February, 2001.

4. "A New View on Mesoporous Aluminas and Iron Oxide Catalyst Stability," Shell Chemical Company, Houston, TX, August, 2001
5. "Synthesis and Characterization of Mesoporous Alumina Molecular Sieves," University of Iowa, Department of Chemistry, October, 2001.
6. "Exploiting the Dynamic Responses of Catalytic Reaction Systems," AIChE Annual Meeting, Reno, NV, November, 2001.
7. "Heterogeneous Catalysis in the Conversion of Biorenewable Feedstocks," Cargill, Inc., Minneapolis, MN, October, 2002.
8. "Current Status of Styrene Catalyst Technology," Atofina Petrochemicals, La Porte, TX, September 3, 2003.
9. "Current Status of Styrene Catalyst Technology," Shell Chemicals, Houston, TX, September 4, 2003.
10. "Nanostructured Materials Designed for Use in the Catalytic Conversion of Biorenewable Feedstocks," Pan-American Advanced Studies Institute, Rio de Janeiro, Brazil, October, 2003.
11. "Designed Catalytic Materials for the Conversion of Biorenewable Feedstocks," Archer Daniels Midland Company, Decatur, IL, November, 2003.
12. "Design of Metal Oxide-Based Catalysts for Biorenewables Conversion," NSF Workshop on Catalysis for Biorenewables Conversion, Washington, D.C., April, 2004.
13. "Synthesis of Hierarchically-Structured Nanoporous Aluminas," Chemistry and Biochemistry Department, University of Denver, Denver, CO, April, 2004.
14. "Chemical Catalysis for Biorenewables Conversion: The Search for Selectivity," National Renewable Energy Laboratory, Golden, CO, April, 2004.
15. "Catalytic Hydrolysis of Oligosaccharides Released from Thermal Treatment of Corn Fiber," Corn Utilization & Technology Conference, Indianapolis, IN, June, 2004.
16. "Reduction Behavior of Potassium Promoted Iron Oxide," Styrene Global Conference – CRI Catalyst Company, Estoril, Portugal, October, 2004.
17. "Organic-Inorganic Hybrid Catalysts for Biorenewable Conversions," Iowa Biotechnology Byproducts Consortium Symposium, Iowa City, IA, October, 2004.

18. "Selective Conversion of Carbohydrates and Their Derivatives with Chemical Catalysts," NSF Workshop on Design of Catalysts Systems for Biorenewables, Washington, D.C., June 23, 2005.
19. "Adding Value to Corn Dry Milling Distiller's Grains," Biobased Industry Outlook Conference, Ames, IA, August 29, 2005.
20. "Heterogeneous Catalysis in the Conversion of Biorenewable Feedstocks," Engelhard Corporation, Beachwood, OH, December 6, 2005.
21. "Industrial Chemicals from Biorenewables and Chemical Catalysts for Their Conversion," Ghent University, Ghent, Belgium, January 19, 2006.
22. "Heterogeneous Catalysts for Biorenewable Conversion," Symposium Honoring ACS Somorjai Award Winner, 231st ACS National Meeting, Atlanta, GA, March 29, 2006.
23. "Midwest Consortium for Sustainable Biobased Products and Energy," Grain Processing Corporation, Muscatine, IA, April 7, 2006.
24. "Heterogeneous Catalysis in the Conversion of Biorenewable Feedstocks," Engelhard Corporation, Iselin, NJ, May 17, 2006.
25. "Heterogeneous Catalyst Design for Biorenewable Conversions," State University of New York at Buffalo, NY, October 4, 2006.
26. "Heterogeneous Catalyst Design for Biorenewable Conversions," Catalysis Club of Chicago, Chicago, IL, October 9, 2006.
27. "Design of Unique Materials for Efficient Catalysis," University of Illinois at Chicago, IL, October 10, 2006.
28. "Styrene Catalysts: Fundamentals of Operation at Low S/O Ratios," CRI Customer Conference, Houston, TX, November 7, 2006.
29. "Heterogeneous Catalyst Design for Biorenewable Conversions," North Carolina State University, Raleigh, NC, January 29, 2007.
30. "Heterogeneous Catalyst Design for Biorenewable Conversions," Louisiana State University, Baton Rouge, LA, March 9, 2007.
31. "Heterogeneous Catalyst Design for Biorenewable Conversions," Michigan State University, East Lansing, MI, March 22, 2007.
32. "A Heartland View of Collaborative Research in Biorenewables," Council for Chemical Research, 28th Annual Meeting, New Orleans, LA, April 16, 2007.

33. "Selective Thermal Processing of Cellulosic Biomass and Lignin," with Czernik, S., NSF Workshop on Breaking the Chemical and Engineering Barriers to Lignocellulosic Biofuels, Washington, D.C., June 25, 2007.
34. "Biomass-Derived Fuels," Lehigh University, Bethlehem, PA, October 31, 2007.
35. "Styrene Catalyst Fundamentals," with Kowaleski, R., CRI Global Styrene Conference, Kauai, Hawaii, November 5, 2007.
36. "Design of Heterogeneous Catalysts for Biorenewable Conversions," ConocoPhillips Company, Ponca City, OK, April 29, 2008.
37. "Design of Organic-Inorganic Hybrid Materials for Use in Converting Biorenewables," Inorganic Chemistry Gordon Conference, Salve Regina University, Newport, RI, July 16, 2008.
38. "Catalysts Designed for Converting Biorenewable Feedstocks" South Dakota School of Mines and Technology, Rapid City, SD, October 21, 2008.
39. "A New Paradigm for Biorenewable Chemical Production," Chevron Phillips Chemical Company, Kingwood, TX, February 3, 2009.
40. "Effect of Ca, Mo, and Ce on the Stability of Potassium-Promoted Iron Oxide," Shell Chemicals, Houston, TX, February 4, 2009.
41. "Catalysts Designed for Converting Biorenewable Feedstocks" Kansas State University, Manhattan, KS, February 10, 2009.
42. "Thermochemical Conversion of Biomass to Fuels via a Fast Pyrolysis-Based Route" University of Puerto Rico - Mayaguez, Mayaguez, PR, February 26, 2009.
43. "Biorenewable Chemicals: Creating a Generalized Production Paradigm," Fritz Haber Institute, Berlin, Germany, August 21, 2009.
44. "Biorenewable Chemicals: Creating a Generalized Production Paradigm," Novozymes, Bagsvaerd, Denmark, August 28, 2009.
45. "Biorenewable Chemicals: Creating a Generalized Production Paradigm," Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November 11, 2009.
46. "The Key Role of Platform Chemicals in Realizing a Shift to Biobased Chemicals," USDA Biopreferred Forum, Ames, IA, April 1, 2010.

47. "Selective Glucose Dehydration using Multifunctional Reaction Systems," University of California - Berkeley, Berkeley, CA, April 6, 2010.
48. "Conversion of Biorenewable Feedstocks: New Challenges in Heterogeneous Catalysis," Plenary Lecture, International Society of Chemical Reaction Engineers, Philadelphia, PA, June 15, 2010.
49. "Multifunctional Catalyst Systems for Converting Carbohydrates and Their Derivatives," Catalysis Gordon Conference, Colby Sawyer College, New London, NH, June 27, 2010.
50. "Design of Heterogeneous Catalysts for the Conversion of Biorenewable Feedstocks," PIRE Workshop, Seon, Germany, August 4, 2010.
51. "Conversion of Biorenewable Feedstocks: New Strategies and Insights," Colorado School of Mines, Golden, CO, September 3, 2010.
52. "Catalysis for Biorenewable Chemicals: Creating a Generalized Production Paradigm," Frontiers in Biorefining Conference, St. Simons Island, GA, October 21, 2010.
53. "Conversion of Biorenewable Feedstocks: New Strategies and Insights," University of Texas – Austin, Austin, TX, November 23, 2010.
54. "NSF Engineering Research Center for Biorenewable Chemicals," USDA NCAUR, Peoria, IL, December 9, 2010.
55. "Developing Biorenewable Platforms through Chemistry and Biology," 2nd Annual Bio-Based Chemicals Summit, San Diego, CA, February 14, 2011.
56. "Activation of Carbohydrates for Selective Conversion." 1st International Symposium on Chemistry of Energy Conversion and Storage, Berlin, Germany, March 1, 2011.
57. "Conversion of Biorenewable Feedstocks: New Strategies and Insights," Eastman Chemical Company, Kingsport, TN, April 14, 2011.
58. "Thermal Deploymerization of Biomass Polymers," Energy and Materials from the Sun Summer School, Rolduc Abbey, Netherlands, June 20, 2011.
59. "Biorenewable Chemicals: Creating a Generalized Production Paradigm," University of Twente, Enschede, Netherlands, June 22, 2011.
60. "Thermochemical Removal of Oxygen from Biomass for Fuel Production," ACS National Meeting, Denver, CO, August 29, 2011.
61. "Chemicals from Biorenewables: Creating a New Catalytic Platform," University of Kansas, Lawrence, KS, September 13, 2011.

62. "Chemicals from Biorenewables: Creating a New Catalytic Platform," New Industrial Chemistry and Engineering Workshop, Council for Chemical Research, University of Delaware, DE, September 22, 2011.
63. "Biorenewable Chemical Production through a Generalized Platform Employing Biological and Chemical Catalyst," DuPont CR&D, Wilmington, DE, September 29, 2011.
64. "The Tyranny of Capital and Scale," National Panel on the Carbon-Negative Economy, Chicago, October 6, 2011.
65. "Biorenewable Chemical Production through a Generalized Platform Employing Biological and Chemical Catalyst," Penn State University, State College, PA, December 8, 2011.
66. "Insight into the ceria-catalyzed ketonization of carboxylic acids," Symposium Honoring ACS Olah and Somorjai Award Winners, 243rd ACS National Meeting, San Diego, CA, March 27, 2012.
67. "Integrating Biological and Chemical Catalysts for Biobased Chemical Production," 34th Symposium on Biotechnology for Fuels and Chemicals, New Orleans, LA, May 1, 2012.
68. "Thermal Deconstruction of Lignocellulosic Biomass," Joint BP-MIT Meeting, Cambridge, MA, May 3, 2012.
69. "Biofuels: Challenges and Opportunities," Council for Chemical Research, 32nd Annual Meeting, Dearborn, MI, May 22, 2012.
70. "Thermochemical Biofuels: Challenges and Opportunities," Auburn University, Auburn, AL, June 14, 2012.
71. "Biobased Chemical Production through a Generalized Technology Platform," Honeywell – UOP, Des Plaines, IL, June 26, 2012.
72. "Thermal deconstruction of lignocellulosic biomass," Symposium in Honor of Eli Ruckenstein, ACS National Meeting, Philadelphia, PA, August 20, 2012.
73. "Bio-based chemicals: acid catalysis in the aqueous phase," Symposium in Honor of Umit Ozkan, ACS National Meeting, Philadelphia, PA, August 22, 2012.
74. "Integrating Biological and Chemical Catalysts for Biobased Chemical Production," Food Science and Human Nutrition seminar, Iowa State University, Ames, IA, September 12, 2012.
75. "What is the Future of Biobased Chemicals?" Joseph Priestley Society series, Chemical Heritage Foundation, Philadelphia, PA, September 20, 2012.

76. "Biobased Chemical Production through a Generalized Technology Platform," Invited Plenary, Sustainable Biorefineries Session, AIChE Annual Meeting, Pittsburgh, PA, October 31, 2012.
77. "Conversion of Bio-based Molecules: New Catalytic Approaches," Georgia Institute of Technology, Atlanta, GA, November 7, 2012.
78. "What is the Future of Biobased Chemicals?" Osborn Club, Iowa State University, Ames, IA, January 14, 2013.
79. "What is the Future of Biobased Chemicals?" National Advanced Biofuels Consortium Annual Meeting, Phoenix, AZ, January 17, 2013.
80. "Biofuels: Challenges and Opportunities," University of Florida, Gainesville, FL, April 2, 2013.
81. "Developing Biobased Chemicals in a Shale Gas World," Invited Plenary, American Society of Microbiology 2013 meeting, Denver, CO, May 19, 2013.
82. "Biobased Chemicals through Integrated Chemistry and Biology," Chemical Engineering Centennial, Iowa State University, Ames, IA, September 26, 2013.
83. "Evaluating Biomass to Alternative Fuels," w/J. Katzer, James Katzer Memorial Session, Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November 5, 2013.
84. "Biobased Chemicals in a Shale Gas World," Tuskegee University, Tuskegee, AL, April 10, 2014.
85. "Biobased Chemicals through Integrated Chemistry and Biology," University of Virginia, Charlottesville, VA, April 24, 2014.
86. "Biobased Chemicals in a Shale Gas World," Corn Utilization & Technology Conference, Louisville, KY, June 3, 2014.
87. "Bioproducts: Overview and Future Directions," Biomass 2014, Washington, D.C., July 30, 2014.
88. "Bioproducts: Overview and Future Directions," Biomass Research and Development Technical Advisory Committee (DOE/USDA), Kansas City, MO, August 19, 2014.
89. "Thermal Deconstruction of Lignocellulosic Biomass," ExxonMobil, Annandale, NJ, September 10, 2014.

90. "Developing Biobased Chemicals in a Shale Gas World," ChevronPhillips, Bartlesville, OK, September 23, 2014.
91. "Bioproducts: Research and Development," Biomass Research and Development Technical Advisory Committee (DOE/USDA), Washington, DC, November 20, 2014.
92. "Future of Bioproducts: Emerging Opportunities in Advanced Biomanufacturing," Congressional Briefing, Washington, DC, February 25, 2015.
93. "Design Rules for Integrating Biology/Chemistry for Biobased Chemicals," NSF Workshop, Arlington, VA, February 26, 2015.
94. "Partnerships for the Development of Biobased Chemicals," Iowa Biotechnology Association - Partnering for Growth Meeting, Ankeny, IA, April 1, 2015.
95. "Economic Development: CBiRC," Iowa Board of Regents Meeting, Ames, IA, June 4, 2015.
96. "Why Integrate Biology/Chemistry for Producing Biobased Chemicals?" with Davis, R.J., PIRE-CatchBio Workshop, Utrecht, Netherlands, July 16, 2015.
97. "Biobased Chemicals through Bridging the Chemical and Biological Catalysis Gap," Defining the Future VI Conference, San Francisco, CA, August 27, 2015.
98. "Biobased Chemicals through Advanced Biomanufacturing," Iowa Board of Regents Meeting, Ames, IA, February 25, 2016.
99. "The Future of Biobased Chemicals," Experimental Biology 2016 Meeting, American Society of Biochemistry and Molecular Biology, San Diego, CA, April 6, 2016.
100. "Development of Biobased Aromatics" Corn Utilization & Technology Conference, St. Louis, MO, June 7, 2016.
101. "Bioproducts Research and Development from Chemicals to Materials" Corn Utilization & Technology Conference, St. Louis, MO, June 7, 2016.
102. "Integrating Biology and Chemistry for the Production of Bioproducts" 5th Pan-American Congress on Plants and BioEnergy, Santa Fe, NM, August 7, 2016.
103. "Materials for Manipulating the Composition of Biomass Pyrolysis Vapors," Award Session in Honor of Prof. Jim Dumesic, Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November 15, 2016.
104. "Bioprivileged Molecule Concept," NSF Workshop, Arlington, VA, January 5, 2017.

105. "Bioprivileged Molecules: Creating Value from Biomass," Washington State University, Pullman, WA, February 6, 2017.
106. "Bioprivileged Molecules: Creating Value from Biomass," Advanced Bioeconomy Leadership Conference, Washington, DC, March 3, 2017.
107. "Creating a General Strategy for the Development of Biobased Chemicals," DOE BETO Workshop, Denver, CO, June 1, 2017.
108. "Bioprivileged Molecules: Creating Value from Biomass," DOE Bioeconomy 2017 Conference, Washington, DC, July 11, 2017.
109. "Leveraging Bioprivileged Molecules for Chemical Production," TECH Talks, Defense Threat Reduction Agency, McClean, VA, September 25, 2017.
110. "Bioprivileged Molecules: A Strategy for Next Generation Chemical Products," 36th Blue-Green Seminar, University of Michigan/Michigan State University, Ann Arbor, MI, October 19, 2017.

Contributed Presentations:

1. "Contact Nucleation from Aqueous Sucrose Solutions," with Berglund, K.A., Summer Meeting, American Institute of Chemical Engineers, Denver, CO, 1983.
2. "Experimental Application of Feedback-Induced Bifurcations in Catalytic Reactor Modeling," with Prairie, M.R., Bailey, J.E., Annual Meeting, American Institute of Chemical Engineers, Miami Beach, FL, November 1986.
3. "025HA Styrene Catalyst Performance," Bi-Annual Meeting, Lummus Styrene Conference, League City, TX, October 1989.
4. "Styrene Reactor Performance Monitoring," Bi-Annual Meeting, Lummus Styrene Conference, Galveston, TX, October 1991.
12. "Next Generation Criterion Styrene Catalysts," Bi-Annual Meeting, Badger Licensee Conference, Boston, MA, October 1992.
13. "C-045 Styrene Catalyst Commercial Performance," Asia Pacific Styrene Technical Conference, Okinawa, Japan, March 1997.
14. "Innovative Clean Catalytic Technologies," with Maxwell, I., Pollution Prevention – Green Chemistry for Chemical and Petroleum Refining Industries, Houston, TX, October 1997.

15. "Thermally-Stable Mesoporous Alumina Molecular Sieves," with Deng, W., Bodart, P., Pruski, M.T., Annual Meeting, American Institute of Chemical Engineers, Los Angeles, CA, November, 2000.
16. "Characterization of Alumina Molecular Sieves," with Deng, W., Bodart, P., Pruski, M.T., 17th North American Catalysis Society Meeting, Toronto, Canada, June, 2001.
17. "Macroscopic Morphology Control of Mesoporous Alumina Molecular Sieves," with Toepke, M.W., Deng, W., Annual Meeting, American Institute of Chemical Engineers, Reno, NV, November, 2001.
18. "Stability of Potassium-Promoted Iron Oxide Dehydrogenation Catalysts," with Ndlela, S., Annual Meeting, American Institute of Chemical Engineers, Reno, NV, November, 2001.
19. "Mechanistic Insight into Glycol Production from Polyhydric Alcohols," with Lahr, D., Annual Meeting, American Institute of Chemical Engineers, Indianapolis, IN, November, 2002.
20. "Reduction Behavior of Potassium-Promoted Iron Oxide Dehydrogenation Catalysts," with Ndlela, S., Annual Meeting, American Institute of Chemical Engineers, Indianapolis, IN, November, 2002.
21. "Heterogeneous Catalysts for Esterification of High Free Fatty Acid Feeds for Biodiesel Production," with Mbaraka, I.K., Annual Meeting, American Institute of Chemical Engineers, Indianapolis, IN, November, 2002.
22. "Design of Nanostructured Catalysts for the Conversion of Biological-Based Feedstocks," Larson-Ruth Symposium, Iowa State University, Ames, IA, April, 2003.
23. "Design of Nanostructured Catalysts for the Conversion of Biorenewable Feedstocks," with Mbaraka, I.K., 25th Symposium on Biotechnology for Fuels and Chemicals, Breckenridge, CO, May, 2003.
24. "Macroscopic to Microscopic View of Bio-Based Products at Iowa State University," Cargill, Inc., Minneapolis, MN, May, 2003.
25. "Surfactant-Assisted Synthesis of Hierarchically Structured Alumina," with Deng, W., Toepke, M.W., 18th North American Catalysis Society Meeting, Cancun, Mexico, June, 2003.
26. "Development of a Catalyst/Sorbent for Methane Reforming," with Wheelock, T.D., Satrio, J.A., DOE Contractors' Review Meeting for University Coal Research, Pittsburgh, PA, June, 2003.

27. "Hydrolysis of Corn Stover Pith and Fiber Fractions Resulting from Mechanical Separation," with Bootsma, J., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2003.
28. "The Role of Sulfur Modification on Ruthenium Catalysts used in Glycol Production from Glycerol" with Lahr, D., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2003.
29. "The Role of Reduction in the Deactivation of Potassium-Promoted Iron Oxide Dehydrogenation Catalysts," with Ndlela, S., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2003.
30. "Development of A Combined Catalyst and Sorbent for Methane Reforming," with Satrio, J.A., Wheelock, T.D., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2003.
31. "Incorporation of Propylsulfonic Acid into Mesostructured Silica by the Grafting Technique," with Hunt, H.K., Mbaraka, I.K., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2003.
32. "Organosulfonic Acid-Functionalized Mesoporous Silica for the Esterification of Free Fatty Acid," with Mbaraka, I.K., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2003.
33. "Corn Stover Recovery for Chemicals and Fiber," with Ren, H., Richard, T.L., Moore, K.J., Bootsma, J., Fan, M., Kuo, M., BIO Conference – Biobased Industry Outlook, Ames, IA, March, 2004.
34. "Catalytic Conversion of High Free Fatty Acid Fats to Alkyl Esters," with Mbaraka, I.K., BIO Conference – Biobased Industry Outlook, Ames, IA, March, 2004.
35. "Oxidative Cleavage of Fatty Acids using Solid Catalysts," with Mbaraka, I.K., BIO Conference – Biobased Industry Outlook, Ames, IA, March, 2004.
36. "A Novel Catalyst/Sorbent Material for Producing Hydrogen from Hydrocarbons," with Satrio, J.A., Wheelock, T.D., AIChE Spring Meeting, New Orleans, LA, April, 2004.
37. "Nanostructured Catalysts Designed for the Conversion of Biorenewables," with Mbaraka, I.K., Catalysis Gordon Conference, Colby-Sawyer College, New Hampshire, June, 2004.
38. "Engineering Chemical Conversions through Catalyst Design," 18th Biennial Conference on Chemical Education, American Chemical Society, Ames, IA, July, 2004.

39. "Application of Combined Catalyst/Sorbent for Hydrogen Generation from Biomass Gasification," with Satrio, J.A., Wheelock, T.D., Annual Meeting, American Institute of Chemical Engineers, Austin, TX, November, 2004.
40. "Organic-Inorganic Hybrid Catalysts for the Hydrolysis of Oligosaccharides," with Bootsma, J.A., Annual Meeting, American Institute of Chemical Engineers, Austin, TX, November, 2004.
41. "Synthesis of Hierarchically-Structured Nanoporous Alumina," with Deng, W., Annual Meeting, American Institute of Chemical Engineers, Austin, TX, November, 2004.
42. "A Combined Catalyst and Sorbent for Enhancing Hydrogen Production from Coal," with Satrio, J.A., Wheelock, T.D., Clearwater Coal Conference, Clearwater, FL, April, 2005.
43. "Mechanistic Insight into the Hydrogenolysis of Higher Polyols on Ru/C," with Lahr, D.G., 19th North American Catalysis Society Meeting, Philadelphia, PA, May, 2005.
44. "Catalytic Conversion of Free Fatty Acids in Beef Tallow," with Mbaraka, I.K., McGuire, K.J., Biobased Industry Outlook Conference, Ames, IA, August, 2005.
45. "Thermochemical Hydrogen Production from Biomass using Core-in-Shell Catalyst/Sorbent Materials," with Satrio, J.A., Wheelock, T.D., Annual Meeting, American Institute of Chemical Engineers, Cincinnati, OH, November, 2005
46. "Characterization of Organsulfonic Acid-Functionalized Mesoporous Silica," with Mbaraka, I.K., Annual Meeting, American Institute of Chemical Engineers, Cincinnati, OH, November, 2005.
47. "Probing Higher Polyol Hydrogenolysis through Stereoisomer Reactions," with Lahr, D.G., Annual Meeting, American Institute of Chemical Engineers, Cincinnati, OH, November, 2005.
48. "Acid-Functionalized Mesoporous Silica Catalysts for the Esterification of Fatty Acids in Beef Tallow," with Mbaraka, I.K., McGuire, K.J., Annual Meeting, American Institute of Chemical Engineers, Cincinnati, OH, November, 2005.
49. "Chemical Catalysts for Adding Value to Distillers Grains," with Bootsma, J.A., BIO 2006 Annual International Convention, Chicago, IL, April, 2006.
50. "Development of a Catalyst/Sorbent for Methane Reforming," with Wheelock, T.D., DOE Contractors' Review Meeting for University Coal Research, Pittsburgh, PA, June, 2006
51. "Selective Conversion of Carbohydrate Derivatives with Chemical Catalysts," World Congress on Industrial Biotechnology, Toronto, Canada, July, 2006.

52. "One-Pot Synthesis of Hierarchically Structured Metal Oxides," with Hakim, S., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2006.
53. "Solid Acid Catalyst for Cellobiose Conversion," with Anderson, J., Mbaraka, I.K., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2006.
54. "Development of a Combined Catalyst and Sorbent for Hydrogen Production," with Albrecht, K., Satrio, J.A., Wheelock, T.D. Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2006.
55. "Production of Synthesis Gas and/or Hydrogen from Biomass Via Fast-Pyrolysis and Reforming Process," with Satrio, J.A., Sadaka, S., Wheelock, T.D., Brown, R.C., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2006.
56. "Upgrading Producer Gas from Biomass Gasification to Produce High Purity Hydrogen," with Sadaka, S., Satrio, J.A., Wheelock, T.D., Brown, R.C., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2006.
57. "Acid-Base Cooperativity in Functionalized Mesoporous Silica," with Hruby, S.L., 20th North American Catalysis Society Meeting, Houston, TX, June, 2007.
58. "Hydrolysis of Oligosaccharides from Distillers Grains Using an Organosulfonic Acid-Functionalized Mesoporous Silica Catalyst," with Bootsma, J.A., Entorf, M., Eder, J., Biobased Industry Outlook Conference, Ames, IA, November, 2007.
59. "Characterization Of Acidic Groups In Functionalized Mesoporous Silica Using Quantum Chemical Simulations," with Yeragi, D.C., Hruby, S.L., Schrader, G.L., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2007.
60. "Stability Of Potassium-Promoted Iron Oxide Dehydrogenation Catalysts," with Li, Z., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2007.
61. "Reaction Testing Of A Core-In-Shell Material Combining Catalysis And Sorption For H₂ Production," with Albrecht, K., Satrio, J.A., Wheelock, T.D., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2007.
62. "Basicity And Catalytic Activity Of Organic Base-Functionalized Mesoporous Silica," with Hruby, S.L., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2007.
63. "Optimizing the Production of Hydrogen from Biomass via Steam Reforming of Pyrolysis Liquids," with Ortiz, P.J., Satrio, J.A., Brown, R.C., Biobased Industry Outlook Conference, Ames, IA, November, 2007.

64. "Product Distribution from Fast Pyrolysis of Biomass," with Patwardhan, P.R., Satrio, J.A., Brown, R.C., Biobased Industry Outlook Conference, Ames, IA, November, 2007.
65. "Synthesis and characterization of new heterogeneous diacid catalysts," with Kilgore, S.L., Scruggs, B.A., Chandler, B.D., ACS National Meeting, New Orleans, LA, April, 2008.
66. "Micellar templates and spectroscopic rulers for synthesis and characterization of site-isolated inorganic catalysts," with Scruggs, B.A., Kilgore, S.L., Chandler, B.D., ACS National Meeting, New Orleans, LA, April, 2008.
67. "Micellar templates and spectroscopic rulers for preparing and characterizing supported catalysts on inorganic oxides," with Scruggs, B.A., Kilgore, S.L., Chandler, B.D., ACS National Meeting, New Orleans, LA, April, 2008.
68. "Product Distribution from Fast Pyrolysis of Biomass," with Patwardhan, P., Satrio, J.A., Brown, R.C., Iowa Academy of Sciences, Cedar Falls, IA, April, 2008.
69. "Effect of Glycosidic Linkage Types on the Product Distribution from Fast Pyrolysis of Polysaccharides," with Patwardhan, P., Satrio, J.A., Brown, R.C., Bioeconomy Conference, Ames, IA, September, 2008.
70. "Role of Solvent In Determining Catalytic Strength In Organic Acid Functionalized Mesoporous Silica," with Cinlar, B., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.
71. "Investigation of Esterification of Biomass Pyrolysis Acids Over Sulfonic Acid-Functionalized Mesoporous Silicas," with Miao, S., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.
72. "Product Distribution from Fast Pyrolysis of Polysaccharides," with Patwardhan, P., Satrio, J.A., Brown, R.C., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.
73. "Role of Promoters on Stability and Activity of Potassium Promoted Iron Oxide Dehydrogenation Catalysts," with Li, Z., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.
74. "Steam Reforming of Different Fractions of Biomass Pyrolysis Liquids," with Ortiz, P., Satrio, J.A., Brown, R.C., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.
75. "Synthesis and Characterization of Novel Hierarchically Structured Aluminosilicate Catalysts," with Hakim, S., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.

76. "Enhancing CO-Water Mass Transfer with MCM41 Nanoparticles and Electrolytes," with Zhu, H., Heindel, T.J., Annual Meeting, American Institute of Chemical Engineers, Philadelphia, PA, November, 2008.
77. "Effect of Minerals on Fast Pyrolysis of Cellulose," with Patwardhan, P., Satrio, J.A., Brown, R.C., 237th ACS National Meeting, Salt Lake City, UT, March, 2009.
78. "Acid Catalyzed Monosaccharide Dehydration in the Condensed Phase," with Cinlar, B., 21st North American Catalysis Society Meeting, San Francisco, CA, June, 2009.
79. "Upgrading of Bio-oil via Acid Removal: Effect of Various Alcohols and Aldehydes on Esterification of Acetic Acid," with Lohitharn, N., Miao, S., 21st North American Catalysis Society Meeting, San Francisco, CA, June, 2009.
80. "Product Distribution From Fast Pyrolysis of Hemicellulose," with Patwardhan, P., Satrio, J.A., Brown, R.C., Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November, 2009.
81. "Reactivity and Carbon Deposition Study on Steam Reforming of Bio-Oil," with Ortiz, P., Satrio, J.A., Brown, R.C., Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November, 2009.
82. "Investigation of Esterification of Biomass Pyrolysis Acids Over Sulfonic Acid-Functionalized Mesoporous Silicas," with Miao, S., Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November, 2009.
83. "Investigating the Kinetics of the Condensed Phase Hydrogenolysis of 5-Methyl-2-Furanmethanol to 2,5-Dimethylfuran Using Copper Catalysts," with Deutsch, K., Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November, 2009.
84. "Combined One-Step Hydrogenation/Esterification over Bifunctional Mesoporous Organic-Inorganic Hybrid Silica: Model Reaction for Bio-Oil Upgrading," with Tang, Y., Miao, S., Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November, 2009.
85. "Acidic Strength Determination of Organic Acid Functionalized Mesoporous Silica by Potentiometric Titration," with Cinlar, B., Annual Meeting, American Institute of Chemical Engineers, Nashville, TN, November, 2009.
86. "Aldol Condensations using Bio-oil Model Compounds: The Role of Acid-Base Bifunctionality," with Snell, R.W., Combs, E., Organic Reactions Catalysis Society, 23rd Conference, Monterey, CA, March, 2010.
87. "Understanding Fast Pyrolysis of Lignin" with Patwardhan, P., Johnston, P.A., Brown, R.C., ACS National Meeting, Boston, MA, August, 2010.

88. "Condensed Phase Hydrodeoxygenation of 5-Methyl-2-Furanmethanol to 2,5-Dimethylfuran using Copper," with Deutsch, K.L., TCS2010 Symposium on Thermal and Catalytic Sciences for Biofuels and Biobased Products, Ames, IA, September, 2010.
89. "Condensed Phase Ketonization of Bio-oil Organic Acids: The Role of Catalyst Redox Properties," with Snell, R, TCS2010 Symposium on Thermal and Catalytic Sciences for Biofuels and Biobased Products, Ames, IA, September, 2010.
90. "Effect of pre-treatments on the fast pyrolysis of biomass," with Patwardhan, Brown, R.C., TCS2010 Symposium on Thermal and Catalytic Sciences for Biofuels and Biobased Products, Ames, IA, September, 2010.
91. "Effect of Pt Loading on Enhancing Aldehyde Hydrogenation for One-step Hydrogenation Esterification (OHE)," with Tang, Y., Miao, S., Pham, H., Datye, A., Zheng, X., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2010.
92. "Direct Observation of Macropore Self-Formation in Hierarchically Structured Metal Oxides," with Dapsens, P.Y., Hakim, S.H., Su, B.L., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2010.
93. "Active Site Determination of Copper Chromite in C-O Hydrogenolysis of a Furfural Derivative," with Deutsch, K.L., 22nd North American Catalysis Society Meeting, Detroit, MI, June, 2011.
94. "Condensed Phase Ketonization of Bio-Oil Model Compounds: Catalysis by Ceria Nanoparticles," with Snell, R.W., Annual Meeting, American Institute of Chemical Engineers, Minneapolis, MN, October, 2011.
95. "Aqueous-Phase Reforming of Bio-Oil Model Compounds Over Pt-Re/C," with Fu, J., Hakim, S.H., Annual Meeting, American Institute of Chemical Engineers, Minneapolis, MN, October, 2011.
96. "Selective Dehydration of Polyols to Commodity Chemicals," with Nolan, M., Annual Meeting, American Institute of Chemical Engineers, Minneapolis, MN, October, 2011.
97. "Hydrothermal Deactivation of Electrophilically Sulfonated Carbon Catalysts," with Anderson, J., Johnson, R., Schmidt-Rohr, K., Iowa Academy of Sciences Meeting, Mason City, IA, April, 2012.
98. "Hydride transfer reactions over acid catalysts, and their role in the dehydration of polyols," with Nolan, M., Iowa Academy of Sciences Meeting, Mason City, IA, April, 2012.
99. "Spectrally Edited Two-dimensional ^{13}C - ^{13}C NMR for Characterizing ^{13}C -Enriched Low-Temperature Carbon Materials," with Johnson, R.L., Anderson, J., Hong, M., Schmidt-

- Rohr, K., 54th Rocky Mountain Conference on Analytical Chemistry, Copper Mountain, CO, July, 2012.
100. "Sodium-Mediated Glucose Pyrolysis: Experimental Results and Mechanistic Dehydration Study," with Mayes, H.B., Zhang, J., Broadbelt, L.J., ACS National Meeting, Philadelphia, PA, August, 2012.
 101. "Production of 5-Hydroxymethylfurfural from Glucose Using Water Compatible Lewis Acid Catalysts in a Biphasic Reactor with an Alkylphenol Solvent," with Wang, T., Gallo, J.M., Dumesic, J.A., Annual Meeting, American Institute of Chemical Engineers, Pittsburgh, PA, October, 2012.
 102. "Hydrothermal Deactivation of Electrophilically Sulfonated Carbon Catalysts," with Anderson, J., Johnson, R., Schmidt-Rohr, K., Annual Meeting, American Institute of Chemical Engineers, Pittsburgh, PA, October, 2012.
 103. "Catalytic Pyrolysis of Red Oak using MgO, Al₂O₃ and Silica-Alumina," with Choi, Y.S., Iowa Academy of Sciences Meeting, Indianola, IA, April, 2013.
 104. "Lignocellulosic Biopolymer Interaction during Fast Pyrolysis," with Zhang, J., Iowa Academy of Sciences Meeting, Indianola, IA, April, 2013.
 105. "Ceria Catalyzed Ketonization of Biomass-Derived Organic Acids," with Snell, R.W., 23rd North American Catalysis Society Meeting, Louisville, KY, June, 2013.
 106. "The Role of Acid Pretreatment in Solvolysis of Switchgrass," with Bai, X., Brown, R.C., Fu, J., Kieffer, M., TCBiomass, Chicago, IL, September, 2013.
 107. "Cellulose-Hemicellulose, Cellulose-Lignin Interactions During Fast Pyrolysis," with Zhang, J., Choi, Y.S., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2013.
 108. "Pyrolysis Chemistry of Lignin Model Compounds: β -O-4 and α -O-4 Linkages," with Choi, Y.S., Zhang, J., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2013.
 109. "Selective Dehydration of Polyols to Commodity Chemicals," with Nolan, M., Wanninayake, U., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2013.
 110. "Acid-Base Bi-Functional Catalysis for Deoxygenation during Cellulose Fast Pyrolysis," with Zhang, J., Choi, Y.S., Nolte, M.W., Annual Meeting, American Institute of Chemical Engineers, Atlanta, GA, November, 2014.

111. "Investigation of Primary and Secondary Reactions during the Pyrolysis of Different Celluloses," with Nolte, M.W., Zhang, J., Annual Meeting, American Institute of Chemical Engineers, Atlanta, GA, November, 2014.
112. "Kinetics and Insights into Glucose Dehydration Catalyzed by Homogeneous Lewis Acidic Metal Salts in Water," with Wang, T., Annual Meeting, American Institute of Chemical Engineers, Atlanta, GA, November, 2014.
113. "Improvement of Sulfonated Carbon Catalyst Hydrothermal Stability Guided by Advanced Solid State NMR," with Johnson, R., Anderson, J., Schmidt-Rohr, K., 24th North American Catalysis Society Meeting, Pittsburgh, PA, June, 2015.
114. "Incorporation of Detailed Phase Behavior and Secondary Reactions in Mechanistic Model of Fast Pyrolysis of Neat Cellulose," with Dellon, L., Zhou, X., Mayes, H.B., Nolte, M., Garcia-Perez, M., Broadbelt, L.J., TCBIomass, Chicago, IL, November, 2015.
115. "Mechanistic Modeling of Catalytic Effects of Na Ions on Fast Pyrolysis of Glucose-Based Carbohydrates," with Zhou, X., Nolte, M., Mayes, H.B., Broadbelt, L.J., TCBIomass, Chicago, IL, November, 2015.
116. "Ex-Situ Hydrodeoxygenation in Biomass Pyrolysis using Molybdenum Oxide and Low-Pressure Hydrogen," with Nolte, M.W., Zhang, J., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2015.
117. "Mechanistic Modeling of Fast Pyrolysis of Glucose-Based Carbohydrates in the Presence of NaCl," with Zhou, X., Nolte, M.W., Mayes, H.B., Broadbelt, L.J., Annual Meeting, American Institute of Chemical Engineers, Salt Lake City, UT, November, 2015.
118. "Improved Hydrothermal Stability of Catalysts for Aqueous Phase Reactions" with Xiong, H., Pham, H.N., Johnson, R.L., O'Neill, B., Schwartz, T.J., Dumesic, J.A., Duan, P., Schmidt-Rohr, K., Datye, A.K., International Congress on Catalysis, Beijing, China, July, 2016.
119. "p-Toluic Acid from Biomass-Derived Coumalic Acid: A Reaction Network Analysis," with Pfennig, T., Johnson, R.L., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2016.
120. "Pd Particle Stabilization on Carbon Supports Under Hydrothermal Conditions," with Huo, J., Johnson, R.L., Duan, P., Pham, H.N., Datye, A.K., Schmidt-Rohr, K., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2016.
121. "Coupling Chemical and Biological Catalysis to Produce Biobased Chemicals," with Schwartz, T.J., Dumesic, J.A., Annual Meeting, American Institute of Chemical Engineers, San Francisco, CA, November, 2016.

122. "Improved Hydrothermal Stability of Pd Particles on Nitrogen-Doped Carbon," with Huo, J., Johnson, R.L., Duan, P., Pham, H.N., Datye, A.K., Schmidt-Rohr, K., 25th North American Catalysis Society Meeting, Denver, CO, June, 2017.
123. "Developing Strategies Around Lactonization of Muconic Acid for Production of Renewable C₆-Cyclic-1,4-Diacid Monomer," with Carraher, J.M., Pfennig, T., Rao, R.G., Tessonnier, J.-P., 25th North American Catalysis Society Meeting, Denver, CO, June, 2017.
124. "Development of High Resolution MAS NMR Techniques to Probe Liquid-Solid Catalytic Interfaces: Characterization of Solvent Effects for Solid Acid Catalysts," with Johnson, R.L., Hanrahan, M.P., Rossini, A.J., Mellmer, M., Dumesic, J.A., 25th North American Catalysis Society Meeting, Denver, CO, June, 2017.
125. "Stabilizing Pd Particles on Nitrogen-Doped Carbon Supports under Hydrothermal Conditions," with Huo, J., Duan, P., Pham, H.N., Datye, A.K., Schmidt-Rohr, K Annual Meeting, American Institute of Chemical Engineers, Minneapolis, MN, October, 2017.

Graduate Students Supervised:

Weihua Deng (University of Delaware, Newark, DE)	1999-2004
Sipho Ndlela (Owens Corning, Granville, OH)	1999-2004
Dan Lahr (Shell, Houston, TX)	2000-05
Isa Mbaraka (Dow Chemical Company, Freeport, TX)	2001-05
Jason Bootsma (Flint Hills, Wichita, KS)	2001-06
Karl Albrecht (w/T.D. Wheelock, Pacific Northwest National Lab, WA)	2004-08
Sarah Hruby (Dow Chemical Company, Philadelphia, PA)	2004-09
Sikander Hakim (GlucanBio, Madison, WI)	2004-09
Zheng Li (Federal Home Loan Bank, Des Moines, IA)	2004-09
Basak Cinlar (Merck, Netherlands)	2005-10
Janice Velazquez (CC1 Industries, Puerto Rico)	2005-07
Pedro Ortiz-Toral (w/R.C. Brown, Gas Technology Institute, Des Plaines, IL)	2006-11
Pushkaraj Patwardhan (w/R.C. Brown, BASF, Iselin, NJ)	2006-10
Keenan Deutsch (BASF, Iselin, NJ)	2007-12
Ryan Snell (Chevron Phillips, Kingwood, TX)	2007-12
Dursun Ozcan (w/T.D. Wheelock, University of Edinburgh)	2008-10
Michael Nolan (Cerium LLC, Dallas, TX)	2008-14
Jason Anderson (Los Alamos National Lab, Los Alamos, NM)	2009-14
Yongsuck Choi (USDA Eastern Regional Research Center, Wyndmoor, PA)	2010-15
Jing Zhang (University of Colorado, Boulder, CO)	2010-14
Tianfu Wang (Xinjiang Technical Institute of Physics & Chemistry, China)	2011-14
Michael Nolte (Intel, Portland, OR)	2011-16
Hugh Warren	2012-16
Umayangani Wanninayake (w/G.A. Kraus)	2012-16
Anita Bejile	2013-15

Jiajie Huo	2013-present
Toni Pfennig	2014-present
Yan Cheng	2014-present
Alireza Saraeian	2015-present
Hsi-Hsin Lin	2016-present

Postdoctoral Scholars:

Justinus Satrio (w/T.D. Wheelock, Villanova University, PA)	2002-06
Isa K. Mbaraka (Dow Chemical Company, Freeport, TX)	2005-06
Haiyang Zhu (BASF, Iselin, NJ)	2006-09
Shaojun Miao (Shell, Houston, TX)	2007-10
Nattaporn Lohitharn (Logos Technologies, Arlington, VA)	2008-09
Sikander Hakim (GlucanBio, Madison, WI)	2009-10
Jie Fu (Zhejiang University, China)	2010-12
Robert Johnson	2014-17
Michael Nolte (Intel, Portland, OR)	2016-17

Visiting Scholars:

Yang Tang (doctoral student, Zhejiang University, China)	2008-10
Canan Marti (doctoral student, METU, Turkey)	2008-09
Alime Izci (assistant professor, Eskişehir Osmangazi University, Turkey)	2009-10
Kyong-Hwan Lee (Principal Researcher, Bioenergy Center, Korea Institute of Energy Research, South Korea)	2012-13
Sebastian Westhaus (senior thesis, Mannheim University, Germany)	2013
Toni Pfennig (masters student, Mannheim University, Germany)	2013

Undergraduate Research Students Supervised:

Mike Toepke (NSF Fellowship, University of Illinois, PhD)	2000-01
Eric Guyer (Stanford University, PhD)	2000
Gishe Tuke	2000
Matthew Kipper (Iowa State University, PhD)	2000
Erik Holmgreen (Ohio State University, PhD)	2000-01
Aaron McKee	2000-02
Scott Long	2001
Nathan Morris	2001-02
Sarah Bauer	2002-03
Mark Dante (University of California – Santa Barbara, PhD)	2002-03
Heather Hunt (NSF Fellowship, California Institute of Technology, PhD)	2002-04
Dan Keenan	2002-03
Kyle McGuire	2002-04

Jeff Nelson	2003
Karen Bodach (Iowa State University, MS)	2003
Nick Lucas	2003
Matt Kossof	2003
Aaron Shell	2004-06
Isaac Vermeersch (Iowa State University, MS)	2004
Zach Meyer	2004
Patrick Harrington	2004
Daryon Shahbahrami	2004-05
Janine Keeley	2005
Ben Selva	2005
Matthew Schultz	2005
Adam Tabor	2005-06
Megan Sellheim	2005
Matt Entorf (Purdue University, PhD)	2006
Judd Eder	2006-07
Paul Low	2006
Cody Jensen (University of Illinois, PhD)	2006-07
Lindsay DeWitte	2006-07
Huitang Ong	2006
Kyle Wagenbach	2006
Zachary Beversdorf	2007-08
Molly Lohry	2007-08, 2011
Brandon Vonk	2007
Chris Wilt	2008
Ryan McClatchy	2008
Jeremy Pace	2008
Brandon Peters (University of Wisconsin, PhD)	2008-09
Christian Tormos	2009
Anna Cline	2009
Marty Dufficy (North Carolina State University, PhD)	2009-10
Erwin Columbus	2009-11
Elliot Combs (NSF Fellowship, University of Minnesota, PhD)	2009, 2011-12
Tingsong Dai	2010
Daniel Weis	2010-11
Hubert Jie	2010
Nathan Fowler	2010
Kossi Sessou	2010, 2012
Geng Sun	2011-12
Erik Mencos	2011
Ashley Leitner	2011-12
Lindsey Berkenpas	2011
Jeff Wilson	2011
Brendan Babcock (Iowa State University, MS)	2011-12
Dalton Hughes (University of Wisconsin, PhD)	2011-12

Justin Glasper	2011-14
Rawini D-Mudiyanselage	2012
Robert Ladd	2012-13
Cole Lopez	2012
Robert Hable	2012-13
Ben Richardson	2013
Karl Alderks	2013
Yadira Cano	2013-14
Collin Coon	2013-14
Nicole Yeager	2015
Aimee Pierce	2015
Evie Goh	2015
Austin Anderson	2015-17
Yee Jher Chan	2016
Nick Brown	2016
Wenjiao Chen	2017
Kelci Coates	2017
Zach Alston	2017

Freshman Honors Students [Andy Brown, Diane Brown (NSF Fellowship), Elliot Combs (NSF Fellowship), Dan Olson, Dan Orr, Shannon Parker, Korin Reid, Calista Saville, John Tjaden, Anthony Young]

DOE SULI Summer Student:

Elliot Combs (Iowa State University) 2009

NSF REU Summer Students:

Jason Anderson (South Dakota School of Mines) 2006

Vivian Ozaka (New Jersey Institute of Technology) 2006

Zachary Beversdorf (Iowa State University) 2007

Miriam Garcia (Monterrey Tec) 2007

Joel Hernandez (University of Puerto Rico, Mayaguez) 2008

Julia Vela Ramírez (Monterrey Tec) 2008

Stephen Nye (University of Massachusetts) 2010

Linda Lippold (Iowa State University) 2010

Cherita Young (San Jose State University) 2011

Scott Nauert (Rice University) 2012

Shirley-Luz Enombo (University of Oklahoma) 2013

Andrew Fox (Bucknell University) 2014

Narcis Danciu (University of Illinois, Chicago) 2015

Sadullah Cakolli (University of Southern Florida) 2016

Zach Alston (Iowa State University) 2017

NSF Summer RETs:

Maureen Griffin, Terry Lebeck 2011

Roberta Vanderah 2012

Marty King 2017

NSF Young Engineers HS

