

JAMES J. SPIVEY

J.M. Shivers Professor
Department of Chemical Engineering
Louisiana State University
Baton Rouge, LA 70803 USA
email: jspivey@lsu.edu
voice: 225-578-3690
fax: 225-578-1476

EDUCATION

B.S., Chemical Engineering, North Carolina State University, 1972

M.S., Chemical Engineering, North Carolina State University, 1974

Ph.D., Chemical Engineering, Louisiana State University, 1980
(Minor – Management; PhD obtained while working at Albemarle)

EXPERIENCE

Jan 2003-present. **Louisiana State University**, Baton Rouge, LA. C.M. Eidt, Jr. and J.M. Shivers Professor, Chemical Engineering Department.

Teaching. Developed new graduate-level course in heterogeneous catalysis; responsible for unit operations lab and course.

Catalysis research. Conduct research in synthesis gas catalysis, catalytic fuel processing for hydrogen production, clean fuels, methane-CO₂ reactions, catalytic decomposition of NO, sulfur-tolerant NO_x traps, and synthesis and testing of novel metal foam reactors.

Director. (2009-2015) Center for Atomic-Level Catalyst Design, a DoE-funded Energy Frontier Research Center (EFRC) supported at \$12.5 million over 6 years, also supported by Louisiana State Board of Regents at a level of \$940k plus \$6.5million cost sharing from 11 institution partners; total \$20 million/6 yrs.

Faculty Research Appointment, US Dept. of Energy. (2001-present) Carry out joint research with DoE investigators; reforming of methane and liquid fuels; fuel processing of fuels to produce syngas.

July 2000-Jan 2003. **NC State University**, Raleigh, NC, Research Professor, Chemical Engineering Department.

Teaching. Responsible for lecture and lab instruction in two Unit Operations courses for 80-90 upperclass students per semester; prepare course material and tests, supervise 5-6 graduate Teaching Assistants, and coordinate lab equipment design and operation.

Catalysis research. Carry out research in NO_x control, fuel processing, Fischer Tropsch synthesis and higher value chemicals from methane and CO₂; Co-Advisor for two post-docs, three PhD candidates, and one MS candidate.

1980 to June 2000. **Research Triangle Institute**, Research Triangle Park, NC, Senior Program Director, Process Research.

Catalysis and adsorption research. Basic and applied research in the development of heterogeneous catalysts and adsorbents. Examples include the conversion of syngas and hydrocarbons to fuels and high value chemicals (e.g., Fischer Tropsch synthesis), aldol condensation, catalytic dehydration and dissociation of methanol, selective hydrogenation, hydrodechlorination, CO₂/methane reactions, catalytic oxidation of organic vapors; catalytic dehydrogenation of fuel hydrocarbons. Additional research includes process development for natural gas and coal conversion processes, development and characterization of carbon-supported catalytic membranes, technical and economic evaluation of SO_x/NO_x control in combustion gases.

Process engineering. Development, analysis, and critical evaluation of engineering cost estimates for pollution control equipment for the steel and copper industries, economic evaluation of gas scrubbing systems, process engineering evaluations of incineration and fine particle filtration.

1974 to 1980. **Albemarle**, Baton Rouge, Louisiana.

Process design. Computer process simulation of distillation of α -olefins; design, specification, and start-up of plant-scale equipment; heat exchanger and catalytic reactor design. Ph.D. was obtained in while working full-time at Ethyl Corporation, with the exception of a year in residence at LSU in 1978, during which I was worked half-time at Ethyl.

Plastics applications. Development of PVC alloys with high heat distortion temperatures, development of novel fine particle emulsion PVC spray drying technology, development of biaxially oriented plastic pipe including equipment design and polymer compound formulation.

Process development. Scale-up of a multi-step batch process for the synthesis of an anti-inflammatory drug for the treatment of osteoarthritis; from bench-scale to commercial plant start-up outside the United States.

HONORS

Fellow, *Royal Society of Chemistry*, Cambridge, UK, 2007

PROFESSIONAL ACTIVITIES

Editor, *Catalysis* book series (Royal Society of Chemistry, Cambridge, UK), Volumes 9-28, 1992-present. (See <http://www.rsc.org/CFbooks/sprindex.cfm?BKC=CA>)

Editor-in-Chief, *Catalysis Today* (Elsevier, Amsterdam), 2011-present. (See <http://www.elsevier.nl/inca/publications/store/5/0/0/8/5/7/index.htm>)

Associate Editor, *Catalysis Today* (Elsevier, Amsterdam), 1994-2010. (See <http://www.elsevier.nl/inca/publications/store/5/0/0/8/5/7/index.htm>)

Editorial Board, *Chemical Engineering Journal* (Elsevier, Amsterdam), 1999-2004.

Adjunct Professor, Chemical Engineering Department, NC State University, Raleigh, NC, 1995-2000.

Editorial Board, *I & EC Research* (American Chemical Society, Washington, DC), 1994-1996.

Editorial Board, *Journal of Advanced Oxidation Technologies*, 1994-1997.

BOOKS EDITED

Fuel Cells: Technologies for Fuel Processing, Elsevier Scientific (Co-Editors, D. Shekhawat and D.A. Berry, DOE Morgantown, WV), 2011. See http://www.elsevier.com/wps/find/bookdescription.cws_home/724635/description#description

Natural Gas Conversion VI, *Studies in Surface Science and Catalysis*, vol. 136, Elsevier Scientific (Co-Editor with E. Iglesia, UC-Berkeley and T.H. Fleisch, BP), 2001. (See <http://www.elsevier.nl/inca/publications/store/6/2/2/1/9/0/>)

Catalyst Deactivation 2001, *Studies in Surface Science and Catalysis*, vol. 139, Elsevier Scientific (Co-Editors, G.W. Roberts, NC State Univ. and B.H. Davis, Univ. Kentucky), 2001. (See <http://www.elsevier.nl/inca/publications/store/6/2/2/3/9/1/index.htm>)

PATENTS

1. "Method of CO and/or CO₂ Hydrogenation using Doped Mixed-metal Oxides", US Patent 9,150,476 B1, Shekhawat; Dushyant, Berry; David A., Haynes; Daniel J., Abdelsayed; Victor, Smith; Mark W., Spivey; James J. , Oct 6. 2015
2. "Pyrochlore Catalysts for Hydrocarbon Fuel Reforming", US Patent 8,241,600 B1 J.J. Spivey, Shekhawat; Dushyant, Berry; David A., Haynes; Daniel J., Abdelsayed; Victor, Smith; Mark W., August 14, 2012
3. "Pyrochlore-type Catalysts for the Reforming of Hydrocarbon Fuels", US Patent 8,133,463 B1, J.J. Spivey, Shekhawat; Dushyant, Berry; David A., Haynes; Daniel J., Abdelsayed; Victor, Smith; Mark W., March 13, 2012
4. "Process for Generation of α - β Unsaturated Carboxylic Acids and Esters using Niobium Catalyst", US Patent 5,998,657 J.J. Spivey, M.R. Gogate, J.R. Zoeller, Dec 7, 1999.
5. "Method of Preparing Acetic Acid by Carboxylation of Methane", International Patent WO 99/59952, J.J. Spivey and M.R. Gogate, November 25, 1999.
6. "Preparation of α - β Unsaturated Carboxylic Acids and Esters", US Patent 5,710,328, M.R. Gogate, J.J. Spivey, J.R. Zoeller, September 15, 1998.
7. "Preparation of α - β Unsaturated Carboxylic Acids and Anhydrides", US Patent 5,808,148, J.J. Spivey, M.R. Gogate, JR. Zoeller, G.C. Tustin, January 20, 1998.
8. "Novel Niobium Catalysts for Vapor Phase Condensation Reactions", Patent Application 775,935, J.J. Spivey, M.R. Gogate, JR. Zoeller January 3, 1997.

PEER-REVIEWED PUBLICATIONS

Book chapters

1. Spivey, James J., "**Deactivation of Reforming Catalysts**" Fuel Cells: Technologies for Fuel Processing, Elsevier Scientific, 2011.
2. M. Gupta, J.J. Spivey, "**Catalytic Processes for the Production of Clean Fuels**", Chapter in vol *New and Future Developments in Catalysis*, in Book Series Catalysis for Remediation and Environmental Concerns, In Press, ISBN 9780444538703.
3. A. Egbebi and Spivey, J.J., "**Bioderived Syngas to Alcohols**," Energy and Environment (Royal Society of Chemistry, Cambridge, UK), v. 1, 2010, 125-145.

4. Spivey, James J., **“Solid catalysts for the oxidation of volatile organic compounds”**, edited by Gerhard Ertl* et al., from Handbook of Heterogeneous Catalysis (2nd Edition) (2008), 5, 2394-2411.
5. D. Shekhawat, D. A. Berry, T. H. Gardner*, and J. J. Spivey, **“Catalytic Reforming of Liquid Hydrocarbon Fuels for Fuel Cell Applications”**, Catalysis (Royal Society of Chemistry, Cambridge, UK), v. 19, 2006, 186-257.
6. M. Rahmani, B. Mohammad; K. Badii, F. Khashaya, M. Mostafa, M. Sanati, N. Cruise, O. Augustsson, Ola, J.J. Spivey, **“Deactivation of Oxidation Catalysts for VOC Abatement by Si and P Compounds”**, Catalysis (Royal Society of Chemistry, Cambridge, UK), v.17, 2004, 210-257.
7. Spivey, J. J., **“Complete Catalytic Oxidation of Volatile Organics”**, Catalysis (Royal Society of Chemistry, Cambridge, UK), v. 8, 1989, 157-203.¹

Peer-reviewed journal papers

1. Wang, Z.; Spivey, J. J., Effect of ZrO₂, Al₂O₃ and La₂O₃ on cobalt-copper catalysts for higher alcohols synthesis. *Applied Catalysis A: General* **2015**, 507, 75-81.
2. Smith, M. W.; Shekhawat, D.; Berry, D. A.; Haynes, D. J.; Floyd, D. L.; Spivey, J. J.; Ranasingha, O., Carbon formation on Rh-substituted pyrochlore catalysts during partial oxidation of liquid hydrocarbons. *Applied Catalysis A: General* **2015**, 502, 96-104.
3. Marano, J.; Spivey, J. J.; Morreale, B., Natural Gas chemical synthesis. *Chemical Engineering Progress* **2015**, 111, 58-62.
4. Mai, K.; Elder, T.; Groom, L. H.; Spivey, J. J., Fe-based Fischer Tropsch synthesis of biomass-derived syngas: Effect of synthesis method. *Catalysis Communications* **2015**, 65, 76-80.
5. Kumar, N.; Shojaee, M.; Spivey, J. J., Catalytic bi-reforming of methane: From greenhouse gases to syngas. *Current Opinion in Chemical Engineering* **2015**, 9, 8-15.
6. Krishna, K. S.; Liu, J.; Tarakeshwar, P.; Mujica, V.; Spivey, J. J.; Kumar, C. S. S. R., Atomically precise gold catalysis. In *RSC Catalysis Series*, **2015**; Vol. 2015-January, pp 87-122.
7. Subramanian, N.; Adeyinka, A.; Spivey, J. J., Catalytic conversion of syngas to i-butanol - Synthesis routes and catalyst developments: A review. In *Catalysis*, **2014**; Vol. 26, pp 161-178.

*Nobel Laureate, Chemistry, 2007

8. Spivey, J. J.; Krishna, K. S.; Kumar, C. S. S. R.; Dooley, K. M.; Flake, J. C.; Haber, L. H.; Xu, Y.; Janik, M. J.; Sinnott, S. B.; Cheng, Y. T.; Liang, T.; Sholl, D. S.; Manz, T. A.; Diebold, U.; Parkinson, G. S.; Bruce, D. A.; De Jongh, P., Synthesis, characterization, and computation of catalysts at the center for atomic-level catalyst design. *Journal of Physical Chemistry C* **2014**, *118*, 20043-20069.
9. Spivey, J. J.; Hutchings, G., Catalytic aromatization of methane. *Chemical Society Reviews* **2014**, *43*, 792-803.
10. Sharma, P.; Elder, T.; Groom, L. H.; Spivey, J. J., Effect of structural promoters on Fe-based fischer-tropsch synthesis of biomass derived syngas. *Topics in Catalysis* **2014**, *57*, 526-537.
11. Prieto, G.; Beijer, S.; Smith, M. L.; He, M.; Au, Y.; Wang, Z.; Bruce, D. A.; De Jong, K. P.; Spivey, J. J.; De Jongh, P. E., Design and synthesis of copper-cobalt catalysts for the selective conversion of synthesis gas to ethanol and higher alcohols. *Angewandte Chemie - International Edition* **2014**, *53*, 6397-6401.
12. Pakhare, D.; Spivey, J., A review of dry (CO₂) reforming of methane over noble metal catalysts. *Chemical Society Reviews* **2014**, *43*, 7813-7837.
13. Pakhare, D.; Schwartz, V.; Abdelsayed, V.; Haynes, D.; Shekhawat, D.; Poston, J.; Spivey, J., Kinetic and mechanistic study of dry (CO₂) reforming of methane over Rh-substituted La₂Zr₂O₇ pyrochlores. *Journal of Catalysis* **2014**, *316*, 78-92
14. Johansson, T.; Pakhare, D.; Haynes, D.; Abdelsayed, V.; Shekhawat, D.; Spivey, J., Characterization of LaRhO₃ perovskites for dry (CO₂) reforming of methane (DRM). *Chemical Papers* **2014**, *68*, 1240-1247.
15. Al-Dossary, M.; Fierro, J. L. G.; Spivey, J. J., Cu-promoted Fe₂O₃/MgO-based Fischer-Tropsch catalysts of biomass-derived syngas. *Industrial and Engineering Chemistry Research* **2014**, *54*, 911-921.
16. Smith, M. W.; Shekhawat, D.; Berry, D. A.; Haynes, D. J.; Floyd, D. L.; Spivey, J. J.; Zondlo, J. W., Effect of the catalyst bed configuration on the partial oxidation of liquid hydrocarbons. *Energy and Fuels* **2013**, *27*, 4363-4370.
17. Sai Krishna, K.; Navin, C. V.; Biswas, S.; Singh, V.; Ham, K.; Bovenkamp, G. L.; Theegala, C. S.; Miller, J. T.; Spivey, J. J.; Kumar, C. S. S. R., Millifluidics for time-resolved mapping of the growth of gold nanostructures. *Journal of the American Chemical Society* **2013**, *135*, 5450-5456.
18. Pakhare, D.; Shaw, C.; Haynes, D.; Shekhawat, D.; Spivey, J., Effect of reaction temperature on activity of Pt- and Ru-substituted lanthanum zirconate pyrochlores (La₂Zr₂O₇) for dry (CO₂) reforming of methane (DRM). *Journal of CO₂ Utilization* **2013**, *1*, 37-42.

19. Liu, J.; Krishna, K. S.; Losovyj, Y. B.; Chattopadhyay, S.; Lozova, N.; Miller, J. T.; Spivey, J. J.; Kumar, C. S. S. R., Ligand-stabilized and atomically precise gold nanocluster catalysis: A case study for correlating fundamental electronic properties with catalysis. *Chemistry - A European Journal* **2013**, *19*, 10201-10208.
20. Gupta, M.; Spivey, J. J., Catalytic Processes for the Production of Clean Fuels. In *New and Future Developments in Catalysis: Catalysis for Remediation and Environmental Concerns*, 2013; pp 87-126.
21. Gaur, S.; Wu, H.; Stanley, G. G.; More, K.; Kumar, C. S. S. R.; Spivey, J. J., CO oxidation studies over cluster-derived Au/TiO₂ and AUROLite™ Au/TiO₂ catalysts using DRIFTS. *Catalysis Today* **2013**, *208*, 72-81.
22. Gardner, T. H.; Spivey, J. J.; Kugler, E. L.; Pakhare, D., CH₄-CO₂ reforming over Ni-substituted barium hexaaluminate catalysts. *Applied Catalysis A: General* **2013**, *455*, 129-136.
23. Gao, F.; Zhao, G. L.; Yang, S.; Spivey, J. J., Nitrogen-doped fullerene as a potential catalyst for hydrogen fuel cells. *Journal of the American Chemical Society* **2013**, *135*, 3315-3318.
24. Abdelsayed, V.; Shekhawat, D.; Poston Jr, J. A.; Spivey, J. J., Synthesis, characterization, and catalytic activity of Rh-based lanthanum zirconate pyrochlores for higher alcohol synthesis. *Catalysis Today* **2013**, *207*, 65-73.
25. Subramanian, N. D.; Kumar, C. S. S. R.; Watanabe, K.; Fischer, P.; Tanaka, R.; Spivey, J. J., A DRIFTS study of CO adsorption and hydrogenation on Cu-based core-shell nanoparticles. *Catalysis Science and Technology* **2012**, *2*, 621-631.
26. Smith, M. L.; Kumar, N.; Spivey, J. J., CO adsorption behavior of Cu/SiO₂, Co/SiO₂, and CuCo/SiO₂ catalysts studied by in situ DRIFTS. *Journal of Physical Chemistry C* **2012**, *116*, 7931-7939.
27. Smith, M. L.; Campos, A.; Spivey, J. J., Reduction processes in Cu/SiO₂, Co/SiO₂, and CuCo/SiO₂ catalysts. *Catalysis Today* **2012**, *182*, 60-66.
28. Midgett, J. S.; Stevens, B. E.; Dassey, A. J.; Spivey, J. J.; Theegala, C. S., Assessing feedstocks and catalysts for production of bio-oils from hydrothermal liquefaction. *Waste and Biomass Valorization* **2012**, *3*, 259-268.
29. Kumar, N.; Smith, M. L.; Spivey, J. J., Characterization and testing of silica-supported cobalt-palladium catalysts for conversion of syngas to oxygenates. *Journal of Catalysis* **2012**, *289*, 218-226.

30. Gupta, M.; Schwartz, V.; Overbury, S. H.; More, K.; Meyer, H. M.; Spivey, J. J., Novel pulse electrodeposited Co-Cu-ZnO nanowire/tube catalysts for C 1-C 4 alcohols and C 2-C 6 (except C 5) hydrocarbons from CO and H 2. *Journal of Physical Chemistry C* **2012**, *116*, 10924-10933.
31. Gaur, S.; Pakhare, D.; Wu, H.; Haynes, D. J.; Spivey, J. J., CO 2 reforming of CH 4 over Ru-substituted pyrochlore catalysts: Effects of temperature and reactant feed ratio. *Energy and Fuels* **2012**, *26*, 1989-1998.
32. Gaur, S.; Miller, J. T.; Stellwagen, D.; Sanampudi, A.; Kumar, C. S. S. R.; Spivey, J. J., Synthesis, characterization, and testing of supported Au catalysts prepared from atomically-tailored Au 38(SC 12H 25) 24 clusters. *Physical Chemistry Chemical Physics* **2012**, *14*, 1627-1634.
33. Gaur, S.; Johansson, S.; Mohammad, F.; Kumar, C. S. S. R.; Spivey, J. J., Catalytic activity of titania-supported core-shell Fe 3O 4@Au nano-catalysts for co oxidation. *Journal of Physical Chemistry C* **2012**, *116*, 22319-22326.
34. Vasireddy, S.; Morreale, B.; Cugini, A.; Song, C.; Spivey, J. J., Clean liquid fuels from direct coal liquefaction: Chemistry, catalysis, technological status and challenges. *Energy and Environmental Science* **2011**, *4*, 311-345.
35. Vasireddy, S.; Ganguly, S.; Sauer, J.; Cook, W.; Spivey, J. J., Direct conversion of methane to higher hydrocarbons using AlBr 3-HBr superacid catalyst. *Chemical Communications* **2011**, *47*, 785-787.
36. Tsai, Y. T.; Mo, X.; Campos, A.; Goodwin Jr, J. G.; Spivey, J. J., Hydrotalcite supported Co catalysts for CO hydrogenation. *Applied Catalysis A: General* **2011**, *396*, 91-100.
37. Subramanian, N. D.; Moreno, J.; Spivey, J. J.; Kumar, C. S. S. R., Copper core-porous manganese oxide shell nanoparticles. *Journal of Physical Chemistry C* **2011**, *115*, 14500-14506.
38. Spivey, J. J., Deactivation of Reforming Catalysts. In *Fuel Cells: Technologies for Fuel Processing*, 2011; pp 285-315.
39. Shekhawat, D.; Spivey, J. J.; Berry, D. A., *Fuel Cells: Technologies for Fuel Processing*, 2011.
40. Schwartz, V.; Campos, A.; Egbebi, A.; Spivey, J. J.; Overbury, S. H., EXAFS and FT-IR characterization of Mn and Li promoted titania-supported Rh catalysts for CO hydrogenation. *ACS Catalysis* **2011**, *1*, 1298-1306.
41. Kumar, N.; Payzant, E. A.; Jothimurugesan, K.; Spivey, J. J., Combined in situ XRD and in situ XANES studies on the reduction behavior of a rhenium promoted cobalt catalyst. *Physical Chemistry Chemical Physics* **2011**, *13*, 14735-14741.

42. Kumar, N.; Jothimurugesan, K.; Stanley, G. G.; Schwartz, V.; Spivey, J. J., In situ FT-IR study on the effect of cobalt precursors on CO adsorption behavior. *Journal of Physical Chemistry C* **2011**, *115*, 990-998.
43. Gupta, M.; Smith, M. L.; Spivey, J. J., Heterogeneous catalytic conversion of dry syngas to ethanol and higher alcohols on Cu-based catalysts. *ACS Catalysis* **2011**, *1*, 641-656.
44. Gaur, S.; Haynes, D. J.; Spivey, J. J., Rh, Ni, and Ca substituted pyrochlore catalysts for dry reforming of methane. *Applied Catalysis A: General* **2011**, *403*, 142-151.
45. Gardner, T.; Kugler, E.; Spivey, J.; Abdelsayed, V. In *Ni-substituted Ba- β -alumina solid oxide catalysts: Structural and performance characteristics during CO 2-CH 4 reforming*, ACS National Meeting Book of Abstracts, 2011.
46. Vasireddy, S.; Campos, A.; Miamee, E.; Adeyiga, A.; Armstrong, R.; Allison, J. D.; Spivey, J. J., Study of attrition of Fe-based catalyst supported over spent FCC catalysts and their Fischer-Tropsch activity in a fixed bed reactor. *Applied Catalysis A: General* **2010**, *372*, 184-190.
47. Subramanian, N. D.; Gao, J.; Mo, X.; Goodwin Jr, J. G.; Torres, W.; Spivey, J. J., La and/or v oxide promoted Rh/SiO₂ catalysts: Effect of temperature, H₂/CO ratio, space velocity, and pressure on ethanol selectivity from syngas. *Journal of Catalysis* **2010**, *272*, 204-209.
48. Smith, M. W.; Berry, D. A.; Shekhawat, D.; Haynes, D. J.; Spivey, J. J., Partial oxidation of liquid hydrocarbons in the presence of oxygen-conducting supports: Effect of catalyst layer deposition. *Fuel* **2010**, *89*, 1193-1201.
49. Shekhawat, D.; Berry, D. A.; Pennline, H. W.; Granite, E. J.; Spivey, J. J., Advanced Fossil Energy Utilization. *Fuel* **2010**, *89*, 1185-1186.
50. Haynes, D. J.; Campos, A.; Smith, M. W.; Berry, D. A.; Shekhawat, D.; Spivey, J. J., Reducing the deactivation of Ni-metal during the catalytic partial oxidation of a surrogate diesel fuel mixture. *Catalysis Today* **2010**, *154*, 210-216.
51. Haynes, D. J.; Campos, A.; Berry, D. A.; Shekhawat, D.; Roy, A.; Spivey, J. J., Catalytic partial oxidation of a diesel surrogate fuel using an Ru-substituted pyrochlore. *Catalysis Today* **2010**, *155*, 84-91.
52. Gupta, M.; Pinisetty, D.; Flake, J. C.; Spivey, J. J., Pulse electrodeposition of Cu-ZnO and Mn-Cu-ZnO nanowires. *Journal of the Electrochemical Society* **2010**, *157*, D473-D478.
53. Gardner, T. H.; Spivey, J. J.; Kugler, E. L.; Campos, A.; Hissam, J. C.; Roy, A. D., Structural characterization of Ni-substituted hexaaluminate catalysts using EXAFS, XANES, XPS, XRD, and TPR. *Journal of Physical Chemistry C* **2010**, *114*, 7888-7894.

54. Gardner, T. H.; Spivey, J. J.; Campos, A.; Hissam, J. C.; Kugler, E. L.; Roy, A. D., Catalytic partial oxidation of CH₄ over Ni-substituted barium hexaaluminate catalysts. *Catalysis Today* **2010**, *157*, 166-169.
55. Egbebi, A.; Spivey, J., Bioderived syngas to alcohols. In *RSC Energy and Environment Series*, 2010; Vol. 2010, pp 125-145.
56. Egbebi, A.; Schwartz, V.; Overbury, S. H.; Spivey, J. J., Effect of Li Promoter on titania-supported Rh catalyst for ethanol formation from CO hydrogenation. *Catalysis Today* **2010**, *149*, 91-97.
57. Campos, A.; Lohitharn, N.; Roy, A.; Lotero, E.; Goodwin Jr, J. G.; Spivey, J. J., An activity and XANES study of Mn-promoted, Fe-based Fischer-Tropsch catalysts. *Applied Catalysis A: General* **2010**, *375*, 12-16.
58. Subramanian, N. D.; Balaji, G.; Kumar, C. S. S. R.; Spivey, J. J., Development of cobalt-copper nanoparticles as catalysts for higher alcohol synthesis from syngas. *Catalysis Today* **2009**, *147*, 100-106.
59. Shekhawat, D.; Berry, D. A.; Haynes, D. J.; Spivey, J. J., Fuel constituent effects on fuel reforming properties for fuel cell applications. *Fuel* **2009**, *88*, 817-825.
60. Haynes, D. J.; Berry, D. A.; Shekhawat, D.; Spivey, J. J., Catalytic partial oxidation of n-tetradecane using Rh and Sr substituted pyrochlores: Effects of sulfur. *Catalysis Today* **2009**, *145*, 121-126.
61. Gupta, M.; Spivey, J. J., Electrodeposited Cu-ZnO and Mn-Cu-ZnO nanowire/tube catalysts for higher alcohols from syngas. *Catalysis Today* **2009**, *147*, 126-132.
62. Spivey, J. J.; Wilcox, E. M.; Roberts, G. W., Direct utilization of carbon dioxide in chemical synthesis: Vinyl acetate via methane carboxylation. *Catalysis Communications* **2008**, *9*, 685-689.
63. Shekhawat, D.; Berry, D. A.; Spivey, J. J., Reforming of liquid hydrocarbon fuels for fuel cell applications. *Catalysis Today* **2008**, *136*, 189.
64. Rankin, R. B.; Campos, A.; Tian, H.; Siriwardane, R.; Roy, A.; Spivey, J. J.; Sholl, D. S.; Johnson, J. K., Characterization of bulk structure in zinc orthotitanate: A density functional theory and EXAFS investigation. *Journal of the American Ceramic Society* **2008**, *91*, 584-590.
65. Haynes, D. J.; Berry, D. A.; Shekhawat, D.; Xiao, T. C.; Green, M. L. H.; Spivey, J. J., Partial oxidation of n-Tetradecane over 1 wt % Pt/ γ -Al₂O₃ and Co_{0.4}Mo_{0.6}Cx Carbide Catalysts: A Comparative Study. *Industrial and Engineering Chemistry Research* **2008**, *47*, 7663-7671.

66. Haynes, D. J.; Berry, D. A.; Shekhawat, D.; Spivey, J. J., Catalytic partial oxidation of n-tetradecane using pyrochlores: Effect of Rh and Sr substitution. *Catalysis Today* **2008**, *136*, 206-213.
67. Egbebi, A.; Spivey, J. J., Effect of H₂/CO ratio and temperature on methane selectivity in the synthesis of ethanol on Rh-based catalysts. *Catalysis Communications* **2008**, *9*, 2308-2311.
68. Spivey, J. J.; Egbebi, A., Heterogeneous catalytic synthesis of ethanol from biomass-derived syngas. *Chemical Society Reviews* **2007**, *36*, 1514-1528.
69. Shekhawat, D.; Berry, D. A.; Gardner, T. H.; Haynes, D. J.; Spivey, J. J., Effects of fuel cell anode recycle on catalytic fuel reforming. *Journal of Power Sources* **2007**, *168*, 477-483.
70. Gardner, T. H.; Shekhawat, D.; Berry, D.; Campos, A.; Roy, A. D.; Smith, M.; Haynes, D.; Kugler, E. L.; Spivey, J. J. In *Catalytic partial oxidation of hydrocarbon fuels: Structural characterization of Ni-substituted hexaaluminate catalysts*, ACS National Meeting Book of Abstracts, 2007.
71. Campos, A.; Spivey, J. J.; Roy, A.; Lohitharn, N.; Goodwin, J.; Lotero, E.; Lamb, H., Characterization of Mo additions in iron-based Fischer-Tropsch catalysts using X-ray absorption spectroscopy and X-ray diffraction. *Nuclear Instruments and Methods in Physics Research, Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* **2007**, *582*, 236-238.
72. Silletti, B. A.; Adams, R. T.; Sigmon, S. M.; Nikolopoulos, A.; Spivey, J. J.; Lamb, H. H., A novel Pd/MgAlO_x catalyst for NO_x storage-reduction. *Catalysis Today* **2006**, *114*, 64-71.
73. Shekhawat, D.; Gardner, T. H.; Berry, D. A.; Salazar, M.; Haynes, D. J.; Spivey, J. J., Catalytic partial oxidation of n-tetradecane in the presence of sulfur or polynuclear aromatics: Effects of support and metal. *Applied Catalysis A: General* **2006**, *311*, 8-16.
74. Chin, P.; Sun, X.; Roberts, G. W.; Spivey, J. J., Preferential oxidation of carbon monoxide with iron-promoted platinum catalysts supported on metal foams. *Applied Catalysis A: General* **2006**, *302*, 22-31.
75. Wang, X.; Spivey, J. J.; Lamb, H. H., NO decomposition over a Pd/MgO catalyst prepared from [Pd(acac)₂]. *Applied Catalysis B: Environmental* **2005**, *56*, 261-268.
76. Spivey, J. J., Catalysis in the development of clean energy technologies. *Catalysis Today* **2005**, *100*, 171-180.
77. Sirijaruphan, A.; Goodwin Jr, J. G.; Rice, R. W.; Wei, D.; Butcher, K. R.; Roberts, G. W.; Spivey, J. J., Effect of metal foam supports on the selective oxidation of CO on Fe-promoted Pt/γ-Al₂O₃. *Applied Catalysis A: General* **2005**, *281*, 11-18.

78. Sirijaruphan, A.; Goodwin Jr, J. G.; Rice, R. W.; Wei, D.; Butcher, K. R.; Roberts, G. W.; Spivey, J. J., Metal foam supported Pt catalysts for the selective oxidation of CO in hydrogen. *Applied Catalysis A: General* **2005**, *281*, 1-9.
79. Shamsi, A.; Spivey, J. J., Partial oxidation of methane on Ni-MgO catalysts supported on metal foams. *Industrial and Engineering Chemistry Research* **2005**, *44*, 7298-7305.
80. Shamsi, A.; Baltrus, J. P.; Spivey, J. J., Characterization of coke deposited on Pt/alumina catalyst during reforming of liquid hydrocarbons. *Applied Catalysis A: General* **2005**, *293*, 145-152.
81. Nikolopoulos, A. A.; Jang, B. W. L.; Spivey, J. J., Acetone condensation and selective hydrogenation to MIBK on Pd and Pt hydrotalcite-derived Mg-Al mixed oxide catalysts. *Applied Catalysis A: General* **2005**, *296*, 128-136.
82. Wang, X.; Sigmon, S. M.; Spivey, J. J.; Lamb, H. H., Support and particle size effects on direct NO decomposition over platinum. *Catalysis Today* **2004**, *96*, 11-20.
83. Chin, P.; Roberts, G. W.; Sun, X.; Spivey, J. J. In *Fuel processing session II: Catalysis and kinetics: Characterization of PROX catalysts on structured supports*, AIChE Annual Meeting, Conference Proceedings, 2004; pp 9081-9088.
84. Wilcox, E. M.; Roberts, G. W.; Spivey, J. J., Direct catalytic formation of acetic acid from CO₂ and methane. *Catalysis Today* **2003**, *88*, 83-90.
85. Roberts, G. W.; Chin, P.; Sun, X.; Spivey, J. J., Preferential oxidation of carbon monoxide with Pt/Fe monolithic catalysts: Interactions between external transport and the reverse water-gas-shift reaction. *Applied Catalysis B: Environmental* **2003**, *46*, 601-611.
86. Zhao, R.; Sudsakorn, K.; Goodwin Jr, J. G.; Jothimurugesan, K.; Gangwal, S. K.; Spivey, J. J., Attrition resistance of spray-dried iron F-T catalysts: Effect of activation conditions. *Catalysis Today* **2002**, *71*, 319-326.
87. Wilcox, E. M.; Roberts, G. W.; Spivey, J. J., Thermodynamics of light alkane carboxylation. *Applied Catalysis A: General* **2002**, *226*, 317-318.
88. Zhao, R.; Goodwin Jr, J. G.; Jothimurugesan, K.; Gangwal, S. K.; Spivey, J. J., Spray-dried iron Fischer - Tropsch catalysts. 1. Effect of structure on the attrition resistance of the catalysts in the calcined state. *Industrial and Engineering Chemistry Research* **2001**, *40*, 1065-1075.
89. Zhao, R.; Goodwin Jr, J. G.; Jothimurugesan, K.; Gangwal, S. K.; Spivey, J. J., Spray-dried iron Fischer-Tropsch catalysts. 2. Effect of carburization on catalyst attrition resistance. *Industrial and Engineering Chemistry Research* **2001**, *40*, 1320-1328.

90. Wilcox, E. M.; Gogate, M. R.; Spivey, J. J.; Roberts, G. W., Direct synthesis of acetic acid from methane and carbon dioxide. In *Studies in Surface Science and Catalysis*, 2001; Vol. 136, pp 259-264.
91. Nikolopoulos, A. A.; Gangwal, S. K.; Spivey, J. J., Effect of periodic pulsed operation on product selectivity in Fischer-Tropsch synthesis on Co-ZrO₂/SiO₂. In *Studies in Surface Science and Catalysis*, 2001; Vol. 136, pp 351-356.
92. Frankel, K. A.; Spivey, J. J.; Roberts, G. W., Mathematical model of the deactivation of Pt/alumina catalyst during the hydrodechlorination of 1,1,1-trichloroethane. In *Studies in Surface Science and Catalysis*, 2001; Vol. 139, pp 439-446.
93. Frankel, K. A.; Jang, B. W. L.; Spivey, J. J.; Roberts, G. W., Deactivation of hydrodechlorination catalysts. I. Experiments with 1,1,1-trichloroethane. *Applied Catalysis A: General* **2001**, *205*, 263-278.
94. Frankel, K. A.; Jang, B. W. L.; Roberts, G. W.; Spivey, J. J., Deactivation of hydrodechlorination catalysts. II - experiments with 1,1-dichloroethylene and 1,1-dichloroethane. *Applied Catalysis A: General* **2001**, *209*, 401-413.
95. Zhao, R.; Goodwin Jr, J. G.; Jothimurugesan, K.; Spivey, J. J.; Gangwal, S. K., Comparison of attrition test methods: ASTM standard fluidized bed vs jet cup. *Industrial and Engineering Chemistry Research* **2000**, *39*, 1155-1158.
96. Öcal, M.; Oukaci, R.; Marcelin, G.; Jang, B. W. L.; Spivey, J. J., Steady-state isotopic transient kinetic analysis on Pd-supported hexaaluminates used for methane combustion in the presence and absence of NO. *Catalysis Today* **2000**, *59*, 205-217.
97. Jothimurugesan, K.; Goodwin Jr, J. G.; Gangwal, S. K.; Spivey, J. J., Development of Fe Fischer-Tropsch catalysts for slurry bubble column reactors. *Catalysis Today* **2000**, *58*, 335-344.
98. Jang, B. W. L.; Spivey, J. J., Catalytic hydrodesulfurization and hydrodechlorination of chloroethyl ethyl sulfide. *Catalysis Today* **2000**, *55*, 3-10.
99. Jang, B. W. L.; Nelson, R. M.; Spivey, J. J.; Ocal, M.; Oukaci, R.; Marcelin, G., Catalytic oxidation of methane over hexaaluminates and hexaaluminate-supported Pd catalysts. *Catalysis Today* **1999**, *47*, 103-113.
100. Jothimurugesan, K.; Spivey, J. J.; Gangwal, S. K.; Goodwin Jr, J. G., Effect of silica on iron-based Fischer-Tropsch catalysts. In *Studies in Surface Science and Catalysis*, 1998; Vol. 119, pp 215-220.
101. Spivey, J. J.; Gogate, M. R.; Zoeller, J. R.; Colberg, R. D., Novel Catalysts for the Environmentally Friendly Synthesis of Methyl Methacrylate. *Industrial and Engineering Chemistry Research* **1997**, *36*, 4600-4608.

102. Jang, B. W. L.; Spivey, J. J.; Kung, M. C.; Kung, H. H., Low-temperature NO_x removal for flue gas cleanup. *Energy and Fuels* **1997**, *11*, 299-306.
103. Gogate, M. R.; Spivey, J. J.; Zoeller, J. R., Synthesis of methyl methacrylate by vapor phase condensation of formaldehyde with propionate derivatives. *Catalysis Today* **1997**, *36*, 243-254.
104. Frankel, K. A.; Jang, B. W. L.; Roberts, G. W.; Spivey, J. J., Deactivation of Pt/alumina catalysts for the hydrodechlorination of 1,1,1-trichloroethane. In *Studies in Surface Science and Catalysis*, 1997; Vol. 111, pp 239-250.
105. Shreiber, E. H.; Mullen, J. R.; Gogate, M. R.; Spivey, J. J.; Roberts, G. W., Thermodynamics of methacrylate synthesis from methanol and a propionate. *Industrial and Engineering Chemistry Research* **1996**, *35*, 2444-2452.
106. Agarwal, S. K.; Spivey, J. J.; Tevault, D. E., Kinetics of the catalytic destruction of cyanogen chloride. *Applied Catalysis B, Environmental* **1995**, *5*, 389-403.
107. Butt, J. B.; Spivey, J. J.; Agrawal, S. K., Catalyst Deactivation in the oxidation of volatile organic compounds by some metal oxides. In *Studies in Surface Science and Catalysis*, 1994; Vol. 88, pp 19-31.
108. Spivey, J. J., Carbon-based catalysts for the low-temperature reduction of NO with NH₃. *Annual Reports on the Progress of Chemistry - Section C* **1993**, *90*, 155-176.
109. Gangwal, S. K.; McMichael, W. J.; Howe, G. B.; Spivey, J. J.; Silveston, P. L. In *Low-temperature carbon-based process for flue-gas cleanup*, Institution of Chemical Engineers Symposium Series, 1993; pp 181-193.
110. Agarwal, S. K.; Spivey, J. J.; Tevault, D. E., Effect of water vapour in the catalytic destruction of cyanogen chloride. *Journal of the Chemical Society, Chemical Communications* **1993**, 911-912.
111. Spivey, J. J.; Butt, J. B., Literature review: deactivation of catalysts in the oxidation of volatile organic compounds. *Catalysis Today* **1992**, *11*, 465-500.
112. Agarwal, S. K.; Spivey, J. J.; Butt, J. B., Deep oxidation of hydrocarbons. *Applied Catalysis A, General* **1992**, *81*, 239-255.
113. Agarwal, S. K.; Spivey, J. J.; Butt, J. B., Catalyst deactivation during deep oxidation of chlorohydrocarbons. *Applied Catalysis A, General* **1992**, *82*, 259-275.
114. Damle, A. S.; Gangwal, S. K.; Spivey, J. J.; Longanbach, J.; Venkataraman, V. K. In *Carbon membranes for gas separation*, Inorganic Membranes ICIM2-91, 1991; pp 273-278.
115. Damle, A. S.; Gangwal, S. K.; Spivey, J. J.; Longanbach, J.; Venkataraman, V. K., Carbon membranes for gas separation. *Key Engineering Materials* **1991**, *61-62*, 273-278.

116. Agarwal, S. K.; Spivey, J. J.; Howe, G. B.; Butt, J. B.; Marchand, C. E., Deactivation of Chromia-Alumina Catalyst for Voc Oxidation. In *Studies in Surface Science and Catalysis*, 1991; Vol. 68, pp 475-478.
117. Spivey, J. J., Recovery of volatile organics from small industrial sources, *Environmental Progress* **1988**, 7, 31-40.
118. Gangwal, S. K.; Mullins, M. E.; Spivey, J. J.; Caffrey, P. R.; Tichenor, B. A., Kinetics and Selectivity of Deep Catalytic Oxidation of n-Hexane and Benzene. *Applied Catalysis* **1988**, 36, 231-247.
119. Spivey, J. J., Complete catalytic oxidation of volatile organics. *Industrial and Engineering Chemistry Research* **1987**, 26, 2165-2180.
120. Kashdan, E. R.; Spivey, J. J.; Cesta, T.; Goodfellow, H. D.; Harmon, D. L.; Coy, D. W., Hood system design for capture of process fugitive particulate emissions, *HPAC Heating, Piping, Air Conditioning* **1986**, 58, 47-54.
121. Wood, J. P.; Spivey, J. J., Economic comparison of flue gas desulfurization systems for reverberatory furnace SO₂ control. *Journal of Metals* **1983**, 35, 47-54.
122. Spivey, J. J.; Bryant, P. A., Hydroisomerization of n-C₅ and n-C₆ mixtures on Pt zeolite **1982**, V 21, 750-760.

FINANCIALLY SUPPORTED INVITED LECTURES/ SHORT COURSE INSTRUCTION (selected from over 100)

“Dry-reforming of methane over Rh-based pyrochlore catalysts”, **252 nd ACS National Meeting**, Philadelphia, PA, Aug. 21-25, 2016; Division of Catalysis Science and Technology (CATL); Abstract No.: 2517812.

“Catalytic bi-reforming of methane using Ni-based pyrochlores”, **6th International Symposium on energy Challenges and Mechanics (ECM6)**, Scotland, UK, 14-18 Aug 2016.

“CO₂ reforming of methane over Ni-based 6%LSNZ pyrochlore catalyst”, **22 nd International Congress of chemical and Process Engineering**, CHISA, Prague, Czech republic, 28-31 Aug 2016.

“Dry reforming of methane on Ni-based pyrochlore catalysts: Understanding carbon deposition mechanism”, **11 th Natural Gas Conversion Symposium (NGCS11)**, Tromso, Norway, June 5-9, 2016; Abstract No.: 1038.

” Study of dry reforming of methane using isotopic ¹³C CO₂ switching”, **251 st ACS National Meeting**, San Diego, CA, Mar. 13-17, 2016; Division of Industrial and Engineering Chemistry; Abstract No.: 2389403.

“Dry reforming over doped Ni-based pyrochlores”, **251 st ACS National Meeting**, San Diego, CA, Mar. 13-17, 2016; ENFL: Division of Energy and Fuels.

“Cobalt-Based Catalysts for the Conversion of Syngas to Ethanol and Higher Alcohols: Formation and Role of Cobalt Carbide”. **2015 AIChE Annual Meeting**, Salt Lake City, USA, Nov 12, 2015.

“Cobalt Carbide Formation for the conversion of Syngas to Ethanol on Cobalt Copper Catalyst.” **24th North American Meeting of the Catalysis Society**, Pittsburgh, PA, USA, June 14-19, 2015.

“Bi-reforming of Methane over Pyrochlore Catalysts”, **Oxford University**, Sept. 2015, KACST-Oxford Conference.

“Reforming of Methane using Substituted Pyrochlores”, **University College-London**, Sept. 2015.

“Natural Gas to Syngas using Rh-Substituted Pyrochlore (La₂Zr₂O₇) Catalysts”, Rice University, **Southwest Catalysis Society Symposium**, Houston, TX, April 2013.

“Catalytic Reforming of Biodiesel for Fuel Cell Applications”, **SEC Symposium**, Atlanta, GA, Feb 2013.

“Catalysis for Clean Energy Technologies”, **Southwest American Chemical Society Conference**, Baton Rouge, LA, Nov 2012.

“Hydrogen from Hydrocarbons: Catalytic Reforming of Liquid Fuels Using Substituted Pyrochlores”, J.J. Spivey, D.A. Berry, D. Shekhawat, D.J. Haynes, M. Smith, **Auburn University Seminar**, Auburn, AL, Nov 2012.

“Hydrogen from Hydrocarbons: Catalytic Reforming of Liquid Fuels Using Substituted Pyrochlores”, J.J. Spivey, D.A. Berry, D. Shekhawat, D.J. Haynes, M. Smith, **IIT Seminar**, Sept 2012.

“Hydrogen from Hydrocarbons: Catalytic Reforming of Liquid Fuels Using Substituted Pyrochlores”, J.J. Spivey, D.A. Berry, D. Shekhawat, D.J. Haynes, M. Smith, **2nd KACST-Oxford Petrochemicals Forum 2012**, Riyadh, Saudi Arabia, Sept 2012.

“Hydrogen from Hydrocarbons: Catalytic Reforming of Liquid Fuels Using Substituted Pyrochlores”, J.J. Spivey, D.A. Berry, D. Shekhawat, D.J. Haynes, M. Smith, **IIT Seminar**, Chicago, IL, Sept 2012.

“Synthesis of Substituted Pyrochlores for Hydrogen Production from Liquid Fuels”, J.J. Spivey, D.A. Berry, D. Shekhawat, D.J. Haynes, M. Smith, **9th International Symposium on New Materials and Nano-Materials for Electrochemical Systems and the XII International Congress of the Mexican Hydrogen Society**, Merida, Yucatan, MX, July 2012.

“CO Hydrogenation over Rh-Based Pyrochlore Catalysts for Higher Alcohols Synthesis”, J.J. Spivey, V. Abdelsayed, D. Shekhawat, D.A. Berry, **ACS National Meeting**, San Diego, CA, March 2012.

“Substituted Pyrochlore Catalysts for Fuel Reforming”, J.J. Spivey, D. Shekhawat, D. Haynes, D. Berry, M. Smith, **61st Canadian Chemical Engineering Conference**, London, Ontario, Canada, Oct 2011.

“Fuel Reforming: Challenges for Catalytic Processes to Produce H₂-Rich Reformate from Liquid Fuels”, J.J. Spivey, D. Shekhawat, D. Haynes, D. Berry, M. Smith, **1st KACST-Oxford Petrochemical Forum**, Oxford University, England, July 2011.

“Effect of Catalyst Configuration on the Partial Oxidation of Hydrocarbons: Graded Bed Approach”, J.J. Spivey, M.W. Smith, D.A. Berry, D. Shekhawat, D.J. Haynes, D.L. Floyd, **22nd NACS Meeting**, Detroit, MI, June 2011.

“Synthesis of Higher Oxygenates from Syngas: Challenges for Catalyst Selectivity and Activity”, **American Chemical Society National Meeting**, San Francisco, CA, Mar 2010.

“Reducing the Deactivation of Ni-Metal During the Catalytic Partial Oxidation of a Surrogate Diesel Fuel Mixture”, J.J. Spivey, D.A. Berry, D. Shekhawat, M.W. Smith, D. J. Haynes, **International Symposium on Catalyst Deactivation**, Delft, The Netherlands, Oct 2009.

“Secure, Clean Fuels From Coal: Indirect Liquefaction”, J.J. Spivey, A. Egbebi, A. Cugini, B. Morreale, S. Song, J.C. Winslow, **2009 Pittsburgh Coal Conference**, Sept 2009.

“Ethanol Formation from Syngas on Modified Methanol Synthesis Catalysts Prepared by Electrodeposition”, **EuropaCat IX**, Salamanca, Spain, Sept 2009.

“Substituted Pyrochlores: New Catalytic Materials for Reforming of Liquid Fuels”, J.J. Spivey, A. Campos, D.A. Berry, D. Shekhawat, D.J. Haynes, M. Smith, **23rd International Materials Research Conference**, Cancun, MX, Aug 2009.

“Low Temperature Methane Activation using Gas Phase AlBr₃-HBr Superacid Catalyst”, J.J. Spivey, S. Vasireddy, S. Ganguly, W. Cook, J. Sauer, **238th ACS National Meeting**, Washington, DC, Aug 2009.

“Catalytic Partial Oxidation of CH₄ over Ni-Substituted Barium Hexaaluminate Catalysts”, J.J. Spivey, T. Gardner, E. Kugler, J. Hissam, A. Campos, A. Roy, **World Congress on Oxidation Catalysis**, Lille, France, July 2009.

“Conversion of Biomass-Derived Syngas to Oxygenates: Hydrogen Carriers for Fuel Cell Applications”, J.J. Spivey, A. Egbebi, **The 3rd International Conference on Renewable Energy Sources**, Tenerife, Spain, June 2009.

"Environmental Catalysis and Energy", two-week short course, **Univ. Limerick, Ireland**, July 2006.

"Environmental Catalysis: Heterogeneous Catalysts for Aldol Condensation Reactions", **Brigham Young University**, Provo, UT, March, 28, 2002 (invited).

"Deactivation of Hydrodechlorination Catalysts: 111 Trichloroethane", **Dow Chemical**, Midland, MI, Aug. 16, 2001.

"Catalysts for Alternate Synthesis Routes for Oxygenates", **Royal Institute of Technology (Kungl Tekniska Hogskolan)**, **Stockholm, Sweden**, May 18, 2001.

"Development of Heterogeneous Catalysts for Environmentally Sound Synthesis Processes", **Clemson University**, **Clemson, SC**, Feb. 14, 2001.

"Multifunctional Heterogeneous Catalysts for Environmentally Sound Synthesis Processes", **University of Kansas**, **Lawrence, KS**, Feb. 7, 2001.

Session Leader, "Catalyst Screening", **Gordon Conference on Green Chemistry**, **Oxford, UK**, July 11-16, 1999.

"Building the Future of Catalysis", **The Elsevier Catalysis Workshop**, **Egmond aan Zee, Netherlands**, April 8-9, 1999.

"Heterogeneous Catalysts for Industrial Condensation Reactions: An Example of Environmental Performance", invited lecture sponsored by the **University of Cincinnati**, **Cincinnati, OH**, October 22, 1998.

"Synthesis of Methyl Methacrylate from Coal-Derived Syngas", R.R. Bannister Distinguished Lecture Series, sponsored by **Union Carbide and the University of West Virginia**, **Morgantown, WV**, October 28, 1997.

"Recovery of Volatile Organic Compounds from Industrial Sources", Short Course sponsored by **U.S. EPA and University of Wisconsin**; **Madison, WI**, Sept. 1990 and **Edison, NJ**, July 1991.

"Catalysts for the Control of Volatile Organics", invited lecture sponsored by the **First International Conference on Advanced Oxidation Technologies for Air and Water Remediation**, **London, Ontario**, June 25-30, 1994.

"Catalytic Oxidation for Control of Volatile Organic Compounds", invited lecture at the **Advances in Catalytic Technology Seminar (Catalytica, Inc.)**, **Redwood City, CA**, Oct. 17-

19,1993.