PURDUE
UNIVERSITY

School of Chemical Engineering

Professional Activity Report 2010-11

Contents

Purdue University
School of Chemical Engineering

Message from the Head

Purdue University Board of Trustees approved the founding of our School of Chemical Engineering on June 14, 1911. Thus, we have declared 2011 as the Centennial Celebration Year! Multiple events and activities are ongoing: 12 Centennial seminars presented by School alumni from different walks of life throughout the 2011 year; a Main Event on October 7-8 2011; the publishing of a book, titled "100 Years of Chemical Engineering at Purdue University, 1911-2011" and a pictorial school history book. For details of the celebration activities and current information, please visit https://engineering.purdue.edu/ChE/AboutUs/Centennial.

This fall we welcome two new faculty members. Bryan Boudouris (BS University of Illinois at Urbana-Champaign, 2004; PhD University of Minnesota, 2009) joins us as Assistant Professor, after completing two years as post-doctoral fellow at the University of California, Berkeley. Bryan's research interests are in optoelectronically active polymers and their applications in solar energy, particularly a) the synthesis of low bandgap homopolymers and block copolymers and their application in organic photovoltaic (OPV) devices; b) the design and utilization of functional polymers for enhanced carrier extraction at the metal/organic interfaces of OPV devices; and c) the fabrication of well-ordered, nanostructured organic non-volatile memory elements from block copolymer templates.

Jeffrey Siirola (BS University of Utah, 1967; PhD University of Wisconsin-Madison, 1970) is an industry veteran, who recently retired as Technology Fellow at Eastman Chemical Company and joins us as Professor of Engineering Practice. His areas of interest include chemical process synthesis, computer-aided conceptual process engineering, chemical process development and technology assessment, sustainable development and growth, carbon management, and chemical engineering education. Siirola is a member of the National Academy of Engineering and was the 2005 President of the American Institute of Chemical Engineers.

Our School is pleased to report high enrollment numbers in both the undergraduate program (499 students from sophomores to seniors) and the graduate program (126 fulltime graduate students, of which 29 joined us this August).

This April, in only the second year since the program was spearheaded by our School, the Electric Vehicle (EV) Grand Prix held the first collegiate evGrandPrix on May 7, 2011. Thirty teams from ten universities competed on a course built on the Indianapolis 500 Speedway grounds, during the Emerging Tech Day, an activity organized as part of the Speedway's 100th anniversary celebration. This is just one example of the kaleidoscope of activities in which our faculty and students are shaping the future.

Along with all this activity, it gives me great pleasure to inform that the goal we set seven years ago to renovate the original part of Forney Hall is now approaching completion. With the generous support of our loyal alumni and friends, we successfully concluded the fund raising campaign for the renovation and are tirelessly working to finish the last phase of the construction in time for the Centennial Celebration main event. We invite you to visit us any time, but especially we hope that you will join us for the Centennial Celebration events during October 7-8, 2011.

Sincerely,

AVarma

Arvind Varma
R. Games Slayter Distinguished Professor
Head, School of Chemical Engineering

PURDUE UNIVERSITY

School of Chemical Engineering
Strategic Plan 2010-2014

Vision:

Be widely recognized among the premier ranks of chemical engineering programs in the world.

Mission:

Provide students with a rigorous and relevant education, conduct field-defining research, and enhance the School's global impact.

Values:

Leadership;
excellence and innovation;
relevance and impact;
commitment and responsibility;
teamwork and partnership;
diversity and respect;
safety and sustainability.

Research: To pursue breakthrough research that extends the boundaries of chemical engineering into areas which promote sustainability and which will have the greatest positive impact on our global society.

Education:

Graduate Programs - Recruit and retain high caliber graduate students from top-tier chemical engineering programs, provide challenging and relevant research programs, and a quality graduate level education.

Undergraduate Programs - Recruit and retain the most capable, motivated and diverse class of undergraduates, and help them to obtain a solid and relevant education throughout their Purdue experience.

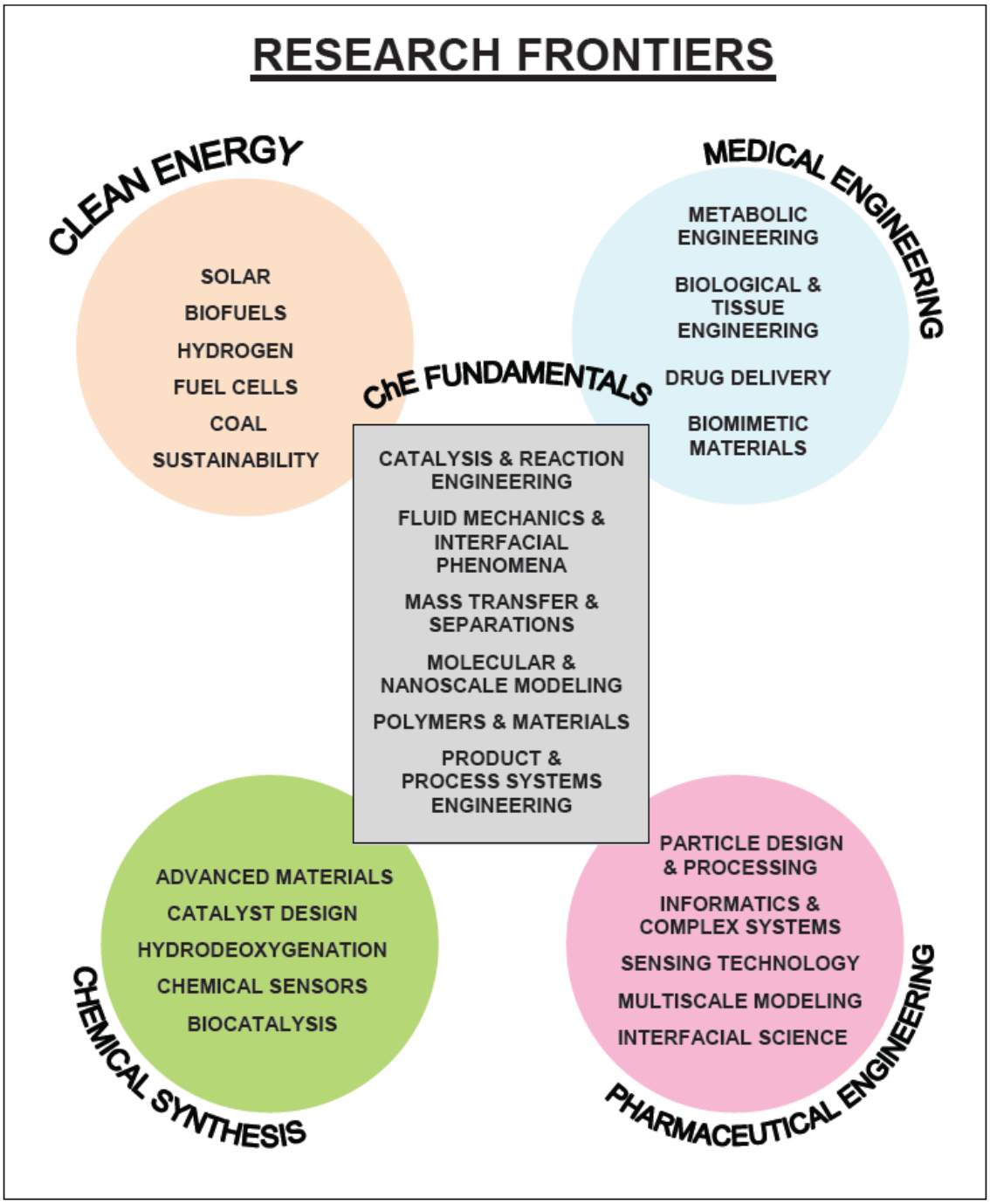
Global Impact: Educate undergraduate and graduate students who will be successful in a global environment. Cultivate and expand research relationships with prominent international research organizations.

Development: Secure and improve the School's financial foundation as a means to continually improve its programs and physical facilities, while balancing short and long term goals.

Engagement: Encourage faculty, staff and students to develop a sense of personal responsibility and accountability for service at both the local and national levels. Promote entrepreneurial activity, leading to intellectual property, including invention disclosures and patents. Become a leader in sustainability on the Purdue campus.

Professional Development and Recognition: Encourage all faculty, staff and students to participate in activities that will enhance their career, develop their skills, and help them become more creative and productive. Actively promote recognition by internal and external award nominations.

Culture and Environment: Create an environment where faculty, staff and students are treated with respect and where superior teamwork is achieved. Enhance and expand safety activities and safety education.



Fields of Study

Catalysis and Reaction Engineering –Delgass, Ramkrishna, Ribeiro, Thomson, Varma

Fluid Mechanics and Interfacial Phenomena - Basaran, Beaudoin, Corti, Franses, Harris, Houze, Kim, Litster

Mass Transfer and Separations – Agrawal, Franses, Wang, Wankat

Molecular and Nanoscale Modeling – Chakrabarti, Corti, Harris, Thomson, Won

Polymers and Materials – Boudouris, Caruthers, Litster, Pipes, Varma, Won, Wu

Product and Process Systems Engineering - Agrawal, Kim, Litster, Pekny, Reklaitis, Venkatasubramanian

Chemical Synthesis - Baertsch, Caruthers, Delgass, Morgan, Ribeiro, Thomson, Varma

Energy - Agrawal, Boudouris, Caruthers, Chakrabarti, Delgass, Ho, Morgan, Pekny, Ramkrishna, Ribeiro, Varma, Wu

Medical Engineering - Caruthers, Chakrabarti, Franses, Liu, Pekny, Ramkrishna, Won, Yuan

Pharmaceutical Engineering - Basaran, Beaudoin, Harris, Kim, Litster, Ramkrishna, Reklaitis, Venkatasubramanian

Faculty

Rakesh Agrawal

Sc. D., Massachusetts Institute of Technology, 1980

Winthrop E. Stone Distinguished Professor

Member, National Academy of Engineering
AIChE Founders Award - 2011

Research Areas

Energy transformation and use issues for solar, coal, biomass and hydrogen economy; Novel separation processes using distillation, membranes and adsorption; Process development, cryogenics and gas liquefaction processes

Selected Professional Activities

Member, Editorial Advisory Board, I&EC Research
Member, Chem. Eng. Department Advisory Committee, WPI
Member, Technical Advisory Boards of Dow Chemicals, Genometica, Kyrogen Ltd.,Weyerhaeuser
Member, NRC Board on Energy and Environmental Systems
Member, NRC Committee on Plug-in Hybrid Electric Vehicles
Member, Board of Trustees AIChE Foundation (2011)

Selected Invited Lectures

"Transportation Fuel Solutions using Renewable Energy," EPFL, Lausanne, Switzerland, September (2010)

"Energy Saving Opportunities in Multicomponent Distillation: Optimum Configuration and Thermal Coupling between Distillation Columns," EPFL, Lausanne, Switzerland, September (2010)

"Chemical Engineering in a Solar Energy Driven Sustainable Future," PPG Foundation Keynote Address, 32nd Annual Chemical Engineering Graduate Student Association Symposium, Carnegie Mellon University, Pittsburgh, PA, October (2010)

"Solar Based Sustainable Energy Solutions," Pirkey Lecture, University of Texas, Austin, TX, November (2010)

"Energy Savings in Distillation via Identification of Useful Configurations," Invited talk in the Gerhold Award Plenary Session on Separations, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Solar Based Sustainable Energy Solutions", Invited Keynote Address, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Synthesis of Multicomponent Distillation Configurations & Solar Cells from Nanocrystal Inks of Quaternary Semiconductors", IIT Kanpur, India, March (2011)

"Chemical Engineering in a Solar Energy Driven Future", IIT Kanpur, March (2011)

"Energy Savings in Distillation via Identification of Useful Configurations", Technical Meeting of the European Federation of Chemical Engineering (EFCE) Working Party on Fluid Separations, Keble College, Oxford University, UK, May (2011)

Selected Publications

Guo, Q.J., Ford, G.M., Yang, W.C., Walker, B.C., Stach, E.A., Hillhouse, H.W. and Agrawal, R., "Fabrication of 7.2% Efficient CZTSSe Solar Cells using CZTS Nanocrystals," *J.Am. Chem. Soc*., **132**, 17384 (2010)

Agrawal, R., & Mallapragada, D.S., "Chemical Engineering in a Solar Energy Driven Sustainable Future", *AIChE Journal*, **56**, (11), 2762 (2010)

Shenvi, A.A., Herron, D. M., and Agrawal, R., "Energy Efficiency Limitations of the Conventional Heat Integrated Distillation Column (HIDIC) Configuration for Binary Distillation," *I&EC Res*. **50**, 119 (2011)

Shah, V., Agrawal R., "Are All Thermal Coupling Links between Multicomponent Distillation Columns Useful from an Energy Perspective?" *I&EC Res*., **50**, 1770 (2011)

Dongaonkar, S., Servaites, J.D., Ford, G.M., Loser, S., Moore, J., Gelfands, R.M., Mohsenis, H., Hillhouse, H.W., Agrawal, R., Ratner, M.A., Marks, T.J., Lundstrom, M., & Alam, A., *J. of Applied Physics*, **108**, 124509 (2010)

Ford, G.M., Guo, Q.J., Agrawal, R., & Hillhouse, H.W., "Earth Abundant Element $Cu_2ZnSn_{1-x}Ge_xS_4$ Nanocrystals for Tunable Band Gap Solar Cells: 6.8% Efficient Device Fabrication", *Chemistry of Materials*, **23**, 2626 (2011)

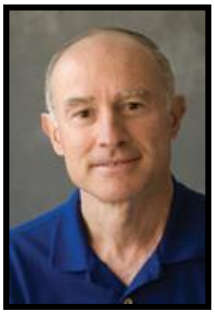
Selected Conference Presentations

Mallapragada, D.S., Singh, N.R., & Agrawal, R., Energy Systems Analysis for a Renewable Transportation Sector", 21st European Symposium on Computer Aided Process Engineering, Porto Carras, Chalkidiki, Greece, May (2011)

Guo, Q.J., Ford, G.M., Hillhouse, H.W., Agrawal, R., PVSC 37 Conference, Seattle, Washington, June (2011)

Intellectual Property

Guo, Q.J., Agrawal, R., & Hillhouse, H.W.,"Rapid Synthesis of Ternary and Multinary Chalcogenide Nanoparticles", US Patent 7,829,059B2 (2010)



Osman Basaran

Ph. D., University of Minnesota, 1984

Burton and Kathryn Gedge Professor

Research Areas: Fluid Mechanics, Rheology, Drop Dynamics, Interfacial Phenomena, Finite Element, Computational Analysis, Ink-Jet Printing, MEMS, Electroseparations

Selected Professional Activities

Session Chair, "Drops X (Session LS)," 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November 21-23, 2010

Selected Invited Lectures

"EHD jetting and emission of charged drops from Taylor cones," Mechanical Engineering Department, Clemson University, Clemson, SC, October (2010)

"EHD jetting and emission of charged drops from Taylor cones," Mechanical Engineering Department, Clemson University, Clemson, SC, October (2010)

"Modeling of free surface flows," Fuji-Dimatix Corporation, Lebanon, NH, July (2010)

Selected Publications

Ramalingam, S. and Basaran, O. A., "2010 Axisymmetric oscillation modes of a double droplet system," *Phys. Fluids* **22**, 112111

Selected Conference Presentations

Sambath, K., and Basaran, O. A., "Electrohydostatics of Capillary Switches," 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November (2010)

Pommer, A. P., Harris, M. T., and Basaran, O. A., "Scaling in two-fluid pinch-off," 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November (2010)

Appathurai, S., Harris, M. T., and Basaran, O. A., "Analogies between a drop impacting a solid surface, an oscillating sessile drop, and two coalescing drops, 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November (2010)

Gao, H., Appathurai, S., McGough, P., Harris, M. T., and Basaran, O. A., "Analysis of the formation of drops of a Bingham fluid," 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November (2010)

McGough, P., Appathurai, S., Gao, H., and Basaran, O. A., "Analysis of the formation of drops of a Herschel-Bulkley fluid," 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November (2010)

Ramalingman, S. and Basaran, O. A., "Oscillations of an asymmetric double droplet system," 63rd Annual Meeting of the Division of Fluid Dynamics (DFD) of the American Physical Society (APS), Long Beach, CA, November (2010)

Stephen P. Beaudoin

Ph. D., North Carolina State University, 1995

Professor

Purdue University Faculty Scholar (2006-2011)

Research Areas

Particle and Thin Film Adhesion, Electronic Materials, Chemical Mechanical Polishing, Biosensors

Selected Professional Activities

President, Particle Division, Adhesion Society, 2008-present

Selected Invited Lectures

"Particle Adhesion Fundamentals," BEST (Building Excellence in Science and Technology) Seminar Series, Andrews University, Berrian Springs, MI, February (2011)

"Moisture Effects in Particle Adhesion," Trace Explosives Detection Workshop, Portland, OR, April (2011)

"Moisture Effects in Particle Adhesion," Trace Explosives Detection Workshop, Portland, OR, April (2011)

Selected Publications

Farrell, M., and Beaudoin, S., "Surface Forces and Protein Adsorption on Dextran- and Polyethylene Glycol-Modified Polydimethylsiloxane," *Colloids and Surfaces B: Biointerfaces*, **81(2)**, 468-475 (2010)

Jaiswal, R., and Beaudoin, S., "Nanoparticle Adhesion Models: Applications in Particulate Contaminant Removal from Extreme Ultraviolet Lithography Photomasks," *Journal of Adhesion Science and Technology*, **25**, 781-797 (2011)

Kilroy, C., Jaiswal, R., and Beaudoin, S., "Adhesion of Contaminant Particles to Advanced Photomask Materials," *IEEE Transactions on Semiconductor Manufacturing*, **In Press** (2011)

Kishore, V., Paderi, J. E., Akkus, A., Smith, K. M., Balachandran, D., Beaudoin, S., Panitch, A. and Akkus, O., "Incorporation of a Decorin Biomimetic Enhances the Mechanical Properties of Electrochemically Aligned Collagen Threads," *Acta Biomaterialia*, **7** 2428–2436 (2011)

Selected Conference Presentations

Smith, K., Jaiswal, R. and Beaudoin, S., "Effects of Varying Surface Film Thickness on Particle Adhesion," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT, November (2010)

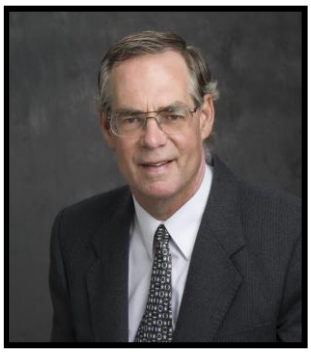
Smith, K. and Beaudoin, S., "Effect of GaN Thin Film Thickness on Particle Adhesion in Semiconductor Applications," 7th Annual SEMATECH Mask Cleaning Workshop, Monterey, CA September (2010)

Zarate, N., Litster, J. and Beaudoin, S., "Nano-Scale Moisture Effects On Pharmaceutical Particle-Surface Interactions," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (2010)

Balachandran, D., Atanasov, S. and Beaudoin, S., "Particle Cohesion Measurement and Simulation for Pharmaceutical Powder Manufacturing," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (2010)

Chaffee-Cipich, M. and Beaudoin, S. P., "Dynamic Deformation in Particle Adhesion," Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (2010)

Smith, K. and Beaudoin, S., "Effect of GaN Thin Film Thickness on Particle Adhesion in Semiconductor Applications," 7th Annual SEMATECH Mask Cleaning Workshop, Monterey, CA September (2010)



James M. Caruthers

Sc. D., Massachusetts Institute of Technology, 1977

Reilly Professor

Research Areas

Materials Design, Non-linear Viscoelasticity of Polymers, Glass-to-Rubber Transition, Engineering Elastomers, Catalyst Design, Bioinformatics

Selected Professional Activities

Board of Directors, Discovery Park Cyber Center
Director, Center of Impact Science

Selected Publications

Lee, E.W., Medvedev, G.A. and Caruthers, J.M., "Deformation Induced Evolution of Mobility in PMMA," *J.Polymer Sci.: Polymer Physics*, **48 (22)**, 2399-2401 (2010)

Maddipati, S.V., Delgass W.N., and Caruthers, J.M., "Determination of the Catalytic Sites for Ziegler Natta Homo-Poymerization from GPC Data," *Macromolecular Theory and Simulation*, **20**, 31-45, (2011)

Bhattacharya, A., Medvedev, G. and Caruthers, J.M., "The Time-Dependent Mechanical Behavior of a Series of Carbon Black Filled Elastomers," *Rubber Chemistry and Technology* (in press)

Nie, X., Prabhu, R., T. Weerasooriya, W., Chen, W. and Caruthers, J. M., "A Kolsky Torsion Bar Technique for Characterization of Dynamic Shear Response of Soft Materials," *Experimental Mechanics* (in press)

Selected Conference Presentations

Invited lecture presented by Medvedev, G. A. and Caruthers, J. M., "A Stochastic Constitutive Model of Glassy Materials Explains Post-Yield Softening," Society of Rheology 82nd Annual Meeting, Santa Fe, NM, October (2010)

Keynote: Caruthers, J. M. and Medvedev, G. A., "Nonlinear Viscoelasticity of Amorphous Polymer Solids: A Review," 7th International Conference on Mechanics of Time-Dependent Materials, Portoroz, Slovenia, September (2010)

Kim, J.W., Medvedev, G. A. and Caruthers, J. M., "Study of the ability of the Nonlinear Viscoelastic Model for Glassy Polymers to predict the Onset of Irreversible Deformation in an Epoxy Resin System," 25th Annual American Society for Composites and 14th U.S.-Japan Conference on Composites Materials, Dayton, OH, September (2010)

Caruthers, J. M. and Medvedev, G. A., "Stochastic Constitutive Model of Amorphous Polymers," 7th International Conference on Mechanics of Time-Dependent Materials, Portoroz, Slovenia, September (2010)

Lee, E.W., Stamm, R. A., Medvedev, G. A. and Caruthers, J. M., "Experimental Observation and Viscoelastic Model Prediction of Non-linear Mechanical Behavior of PMMA in the Glass Transition Region," Society of Rheology 82nd Annual Meeting, Santa Fe, NM, October (2010)

Intellectual Property

Battery cell diagnostics of state-of-charge and prognostics of state-of-health using vibrom-acoustic interrogation, D. Adams, J.M. Caruthers, F. Sadeghi, M. Suchomel, Nathan Sharp and A. David, Invention disclosure, February (2011)

2D pressure distribution for internal state-of-health and failure prediction, J.M. Caruthers, D. Adams, F. Sadeghi and M. Suchomel, Invention disclosure, March (2011)

Raj Chakrabarti
PhD, Princeton University, 2002

Assistant Professor

Research Areas
Quantum Control and Information Theory, Theoretical and Computational Biophysics, Application to Energy Sciences

Selected Professional Activities
Reviewer:

- Peer-reviewer of journal publications: Journal of Statistical Physics, Europhysics Letters (2010)
- NSF CBET Biocatalysis Review Panel, January, 2010
- French National Research Council Reviewer, Quantum Control, 2010

Selected Publications
Brif, C., Chakrabarti, R. and Rabitz, H., "Control of Quantum Phenomena: Past, Present and Future," *New Journal of Physics*, **12**, 075008 (2010)

Chakrabarti, R., Bartning, A. P. and Sengupta, S., "Developing globally compatible institutional infrastructures in Indian higher education," *Journal of Studies in International Education*, **14**, 183-199 (2010)

Moore, K., Chakrabarti, R., Rivello, G., and Rabitz, H., "Search complexity and resource scaling for quantum optimal control of unitary transformations," *Physical Review A*, **83**, 012326, (2011)

Chakrabarti, R., "Notions of local controllability and optimal feedforward control for quantum systems," *J. Phys. A.* (in press)

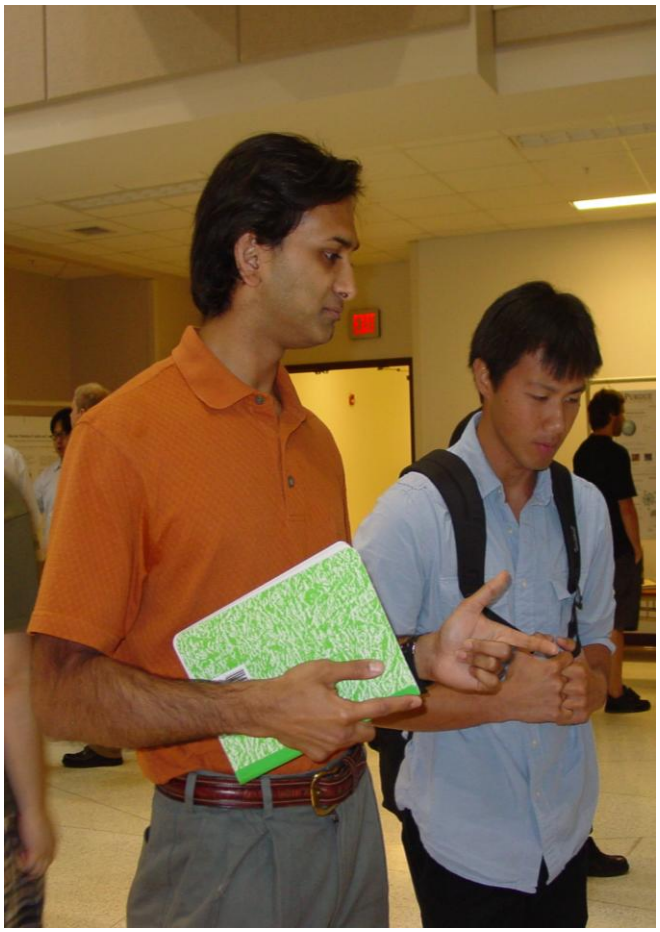
Brif, C., Chakrabarti, R. and Rabitz, H., "Control of Quantum Phenomena," In: *Advances in Chemical Physics, ed*. S.A. Rice, Wiley, NY (in press)

Selected Conference Presentations
Marimuthu, K., and Chakrabarti, R., "Kinetic Modeling and Optimal Control of the Polymerase Chain Reaction," AICHE Conference at Salt Lake City, UT, November (2010)

Keynote: Chakrabarti, R., "Engineering Control Concepts and their Applications to Quantum Control," Quantum Control Workshop, Banff International Research Station for Mathematical Innovation and Discovery, Alberta, Canada, April (2011)

Invited: Chakrabarti, R., "Molecular Control Engineering – Prospects and Challenges," 242nd ACS National Meeting Symposium on Reduced Density Metrics in Quantum Chemistry and Physics, Denver, CO, August (2011)

Intellectual Property
Chakrabarti, R. and Schutt, C.E., Compositions for enhancing polynucleotide amplification reactions," US Patent 7,772,383 (issued 08-10-2010)



David S. Corti

Ph. D., Princeton University, 1997

Professor
Director of Undergraduate Studies

Research Areas

Molecular Thermodynamics, Metastable Liquids, Nucleation Phenomena, Collodial Dispersions, Computer Simulation Techniques

Selected Professional Activities

Member, Area 1a Programming Committee, AIChE (Term: September 2007 to November 2010)

Chair, Area 1a Program Committee, AIChE (Term: November 2010 to November 2012)

Selected Invited Lectures

Franses, E.I.*(speaker), Dong, J., Park, Y. and Corti, D. S., "Colloidal Dispersion Stability of CuPc Pigment Nanoparticles: Effects of Triton X-100 and NaNO3," HP Labs, Palo Alto, CA, December (2010)

"On the Surface Thermodynamics of Nanoscale Droplets and Bubbles," National Institute of Standards and Technology, Gaithersburg, MD, June (2011)

Selected Publications

Torabi, K. and Corti, D. S., "Molecular Simulation Study of Cavity-Generated Instabilities in the Superheated Lennard-Jones Liquid," *J. Chem. Phys*., **133**, 134505(1-14), (2010)

Uline, M.J., Torabi, K. and Corti, D.S., "Homogeneous Nucleation and Growth in Simple Fluids I. Fundamental Issues and Free Energy Surfaces of Bubble and Droplet Formation," *J. Chem. Phys*., **133**, 174511(1-15), (2010)

Uline, M. J., Torabi, K. and Corti, D. S., "Homogeneous Nucleation and Growth in Simple Fluids II Scaling Behavior, Instabilities and the (n,v) Order Parameter," *J. Chem. Phys*., **133**, 174512(1-13), (2010)

Siderius, D.W., and Corti, D.S., "Extension of Scaled Particle Theory to Inhomogeneous Hard Particle Fluids. IV. Cavity Growth at any Distance Relative to a Planar Hard Wall," *Phys. Rev. E*. (in press)

Siderius, D. W. and Corti, D. S., "Extension of Scaled Particle Theory to Inhomogeneous Hard Particle Fluids. IV. Cavity Growth at any Distance Relative to a Planar Hard Wall," *Phys. Rev. E*. **83**, 031126(1-20), (2011)

Corti, D. S., Kerr, K. J. and Torabi, K., "On the Interfacial Thermodynamics of Nanoscale Droplets and Bubbles," *J. Chem. Phys*., **135**, 024701(1-20), (2011)

Selected Conference Presentations

Torabi, K. and Corti, D. S., "Homogeneous Nucleation and Growth: From Equilibrium-Based Analysis of Bubbles to the Dynamics of the Phase Transition," AIChE National Meeting, Salt Lake City, UT, November (2010)

Sturtevant, B. and Corti, D. S., "Computational Studies of Local Friction Coefficients in Confining Geometries," (Session in Honor of William Russell), AIChE National Meeting, Salt Lake City, UT, November (2010)

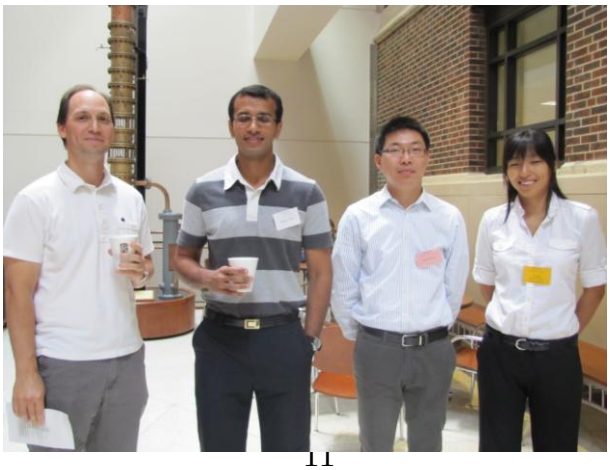
Sturtevant, B. and Corti, D. S., "Cluster Dynamics in the Presence of Surfaces," AIChE National Meeting, Salt Lake City, UT, November (2010)

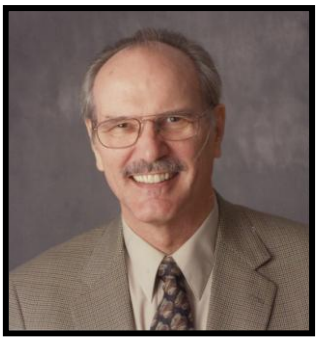
Kerr, G., Torabi, K. and Corti, D. S., "On the Surface Thermodynamics of Nanoscale Droplets and Bubbles," AIChE National Meeting, Salt Lake City, UT, November (2010)

Dong, J., Chen, S., Corti, D. S., Franses, E. I., Zhao, Y., Hanson, E. and Ng, H. T., "Colloidal Dispersion Stability of CuPc Pigment Nanoparticles: Effects of Triton X-100 and $NaNO_3$," AIChE National Meeting, Salt Lake City, UT, November (2010)

Torabi, K. and Corti, D. S., "Homogeneous Bubble Nucleation in Superheated Liquids: From the Underlying Free Energy Surface to the Dynamics of Nucleation and Growth," 85th ACS Colloid & Surface Science Symposium, Montreal, Quebec, Canada, June (2011)

Corti, D.S., Kerr, G. J. and Torabi, K., "On the Interfacial Thermodynamics of Nanoscale Droplets and Bubbles," 85th ACS Colloid & Surface Science Symposium, Montreal, Quebec, Canada, June (2011)





W. Nicholas Delgass

Ph. D., Stanford, 1969

Maxine Spencer Nichols Professor

Inaugural North American Catalysis Society Award for Distinguished Service in the Advancement of Catalysis, 2011

Research Areas

Heterogeneous catalysis, catalyst design by *Discovery Informatics*, olefin polymerization, water gas shift reaction, propylene epoxidation over Au nanoparticles, spectroscopy of surfaces, biofuels

Selected Professional Activities

Editorial Board, Journal of Catalysis
Two day short course on kinetic analysis to Conoco Phillips, April 19-20, 2011

Selected Invited Lectures

"Characteristics of Catalytic Sites for the Water Gas Shift Reaction," 240th ACS National Meeting, Boston, MA, August (2010)

"Toward the Design of Catalysts," AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Selected Publications

Smelts, A. D., Delgass, Nicholas, W., Ribeiro, Fabio H., "Oxidation of NO with O2 on Pt(111) and Pt(321) large single crystals," *Langmuir*, **26 (21)**, 16578–16588 (2010)

Williams, W. D., Shekhar, M., Lee, W.S., Kispersky, V. F., Delgass, W.N., Ribeiro, F. H., Kim, S. M., Stach, E. A., Miller, J. T., Allard, L. F., "Metallic Corner Atoms in Gold Clusters Supported on Rutile are the Dominant Active Site during Water-Gas Shift Catalysis," *J. Am. Chem. Soc, Commun*., **132 (40)**, 14018-14020 (2010)

Maddipati, Sridhar V., Delgass, Nicholas W., Caruthers, James M., "Determination of the Catalytic Sites for Ziegler Natta Homo-Polymerization from GPC Data," *Macromolecular Theory and Simulations*, **20**, 31-45 (2011)

Pazmiño, J. H., Mulla, S. S., Miller, J.T., Delgass, N.W. PhD; Ribeiro, F.H., "Kinetic studies of the stability of Pt for NO oxidation: Effect of sulfur and long term aging," *J. Catal.* , **282**, 13–24 (2011)

Chaugule, S. S., Kispersky, V. F., Ratts, J. L., Yezerets, A., Currier, N. W., Ribeiro, F. H. and Delgass, N. W., "Formation and Removal of Ba-Carbonates or Carboxylates on Pt/BaO/ -Al2O3 Lean NOx Traps," *Applied Catalysis B: Environmental*, **107**, 26-33, (2011)

Lee, W-S., Zhang, R., Akatay, M.C., Baertsch, C., Stach, E., Ribeiro, F. H. and Delgass, N. W., "Differences in Catalytic Sites for CO Oxidation and Propylene Epoxidation on Au Nanoparticles," *ACS Catalysis*, **1**, 1327–1330 (2011)

Selected Conference Presentation

Chaugule, S. S., Kispersky, V. F., Ratts, J. R., Yezerets, A., Currier, N. W., Ribeiro, F. H., Delgass, W. N., Gordon Research Conference in Catalysis, Poster, "NO_x Storage and Reduction on Pt/BaO/γ-Al_2O_3," NH. July (2010)

Shekhar, M., Williams, W. D., Lee, W. S., Delgass, W. N., Ribeiro, F. H., Kim, S. M., Stach, E. A., Miller, J. T., Allard Jr, L. F., 2010 Gordon Research Conference – Catalysis, Poster, "Corner Atoms are Active Sites for Nanoparticle Gold Water-Gas Shift Catalysts," Colby-Sawyer College, New London, NH , July (2010)

Fingland, B. R., Dietrich, P. J., Ribeiro, F. H., Guo, N., Dumesic, J. A. and Miller, J. T., "Liquid phase operando X-ray absorption spectroscopy (XAS): Glycerol reforming over a PtMo/C catalyst," The 240th ACS National Meeting, Boston, MA, August (2010)

Wang, J., Delgass,W. N. and Ribeiro, F. H., "Development of an operando transmission Fourier Transform Infrared (FTIR) catalysis reactor system and investigation of a steady state isotopic transient kinetic analysis on water gas shift (WGS) reaction," The 240th ACS National Meeting, Boston, MA, August (2010)

Lee,W-S., Ribeiro, F. H. and Delgass, W. N., "Effects of Preparation Conditions on Au/TS-1 for Gas Phase Propylene Epoxidation," AIChE National Meeting, Salt Lake City, UT, November (2010)

Mallapragada, D., Delgass, W. N., Ribeiro, F. H. and Agrawal, R., "The Scope of Using Concentrated Solar Energy to Produce Liquid Fuels from Biomass," AIChE National Meeting, Salt Lake City, UT, November (2010)

Kispersky, V., Chaugule, S. S., Yezerets, A., Currier, N. W., Ribeiro, F. H. and Delgass, W. N., "Formation and Removal of Ba-Carbonates/Carboxylates on Pt/Ba/Al2O3 Lean Nox Traps," AIChE National Meeting, Salt Lake City, UT, November (2010)

Pazmino, J., Bollmann, L., Kispersky, V., Williams, D., Shekhar, M., Miller, J. T., Elam, J. W., Mane, A., Delgass, W. N. and Ribeiro, F. H., "Performance Enhancement of Low Temperature Water Gas Shift Catalysts by Palladium-Iron and Platinum-Iron Interactions," AIChE National Meeting, Salt Lake City, UT, November (2010)

Williams, W. D., Shekhar, M., Lee, W-S., Kispersky, V., Wang, J., Delgass, W. N., Ribeiro, F. H., Kim, S. M., Stach, E. A., Miller, J. T. and Allard, L. F., "Determination of the Active Site for Nanoparticle Gold Water-Gas Shift Catalysts Using a Model Support," AIChE National Meeting, Salt Lake City, UT, November (2010)

Shekhar, M., Williams, W. D., Lee, W-S., Delgass, W. N., Ribeiro, F. H., Kim, S. M., Stach, E. A. and Miller, J. T., "Kinetic Studies on Au and Pt Catalysts Supported on Model Al2O3 and TiO2 for the WGS Reaction," AIChE National Meeting, Salt Lake City, UT, November (2010)

Elias I. Franses

Ph. D., Minnesota, 1979

Professor

Research Areas

Adsorption and Tension Equilibria and Dynamics of Surfactants and Proteins at Fluid/Fluid and Fluid/Solid Interfaces. Sorbents and Sorbent-Solvent-Sorbate Interactions of Chiral Molecules for Chiral Bioseparations of Enantiomers. Colloidal Stability of Aqueous Dispersions of Pigment Nanoparticles and of Hydrocarbon Hydrate Particles in Hydrocarbons.

Selected Invited Lectures

"Effect of Triton X-100 on the Dispersion Stability of CuPc Pigment Nanoparticles in Aqueous Solutions," with J. Dong and D. S. Corti, Hewlett-Packard Co, Palo Alto, CA, December (2010)

Selected Publications

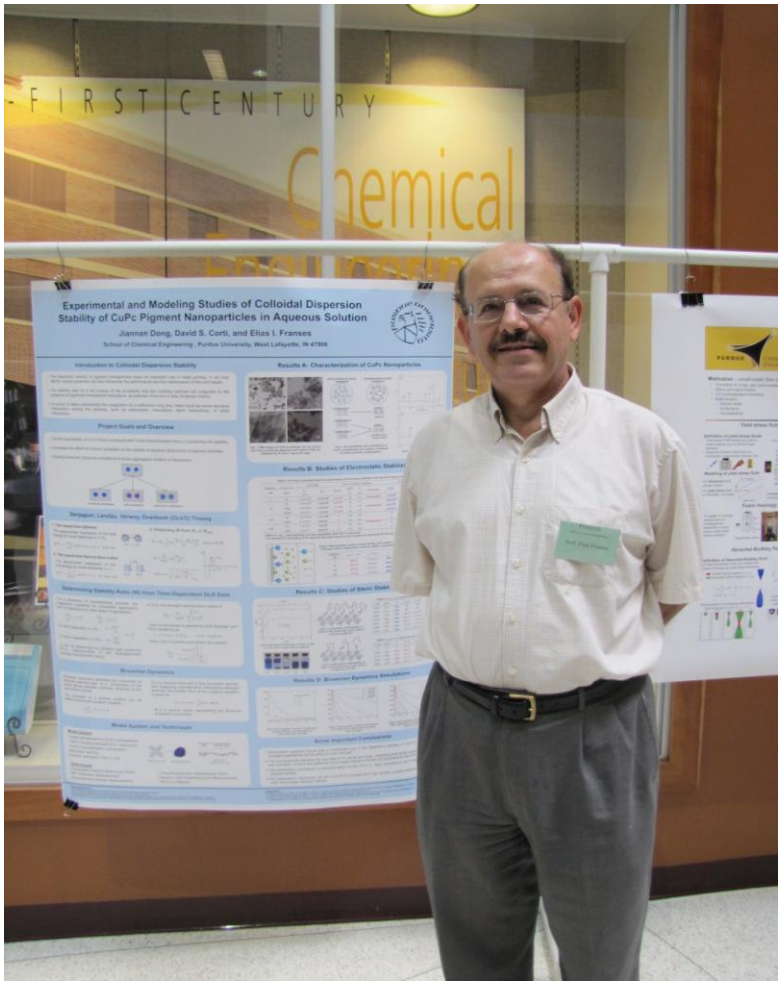
Dong, J., Chen, S., Corti, D. S., Franses, E. I., Ng, H. T., Zhao,Y., and Hanson, E., "Effect of Triton X-100 on the Dispersion Stability of Aqueous Dispersions of Copper Phthalocyanine Pigment Nanoparticles," *J. Colloid Interf. Sci*, **362(1)**, 33-41 (2011)

Selected Conference Presentations

Park, Y., "Dispersion Stability and Dynamic Surface Tension of Aqueous DPPC and Interactions with Albumin," AICHE Annual Meeting, Salt Lake City, UT, November (2010)

Dong, J., Chen, S., Corti, D.S., Zhao, Y., Hanson, E. and Ng, H.T., "Colloidal Dispersion Stability of CuPc Pigment Nanoparticles: Effects of Triton X-100 and NaNO3," AICHE Annual Meeting, Salt Lake City, UT, November (2010)

Tsui, H-W, Kasat, R. B. and Wang, N-H. L., "IR Spectroscopy and Molecular Simulation Studies of a Polymeric Sorbent with Chiral Enantiomers," AICHE Annual Meeting, Salt Lake City, UT, November (2010)



Robert E. Hannemann

M.D., Indiana University, 1959

Visiting Professor

Research Areas

Healthcare Engineering, Modeling Erythrocyte size distribution for evaluation of Lukemia chemotherapy, serum bilirubin determination by skin reflectance, surfactant in respiratory distress syndrome treatment

Selected Professional Activities

Executive Committee and Liaison for the Center for Assistive Technology, Regenstrief Center on Healthcare Engineering, Purdue University
Chair, Healthcare Engineering Signature Area, Purdue University
Board of Directors, National Center for Missing and Exploited Children
Indiana Clinical and Transitional Sciences Institute Project Development Team

Selected Invited Lectures

"Chemical Engineering Centennial Seminar," School of Chemical Engineering, Purdue University January (2011)

Selected Publications

Sherer, E., Hannemann, R.E., Rundell, A. and Ramkrishna, D., "Application of Stochastic Equations of Population Balances to Sterilization Processes," *Chemical Engineering Science*, **Vol. 64**, 764-774 (2010)

R. Neal Houze

Ph. D., University of Houston, 1968

Professor
Conoco Phillips Faculty Fellow, 2009-10
Inducted in Purdue Co-Op Hall of Fame, 2010

Selected Professional Activities

Purdue University Senate, Superior Student Committee
Ombudsman for College of Engineering, Purdue University
Interdisciplinary Engineering Committee, College of Engineering, Purdue University

Michael T. Harris

Ph. D., University of Tennessee – Knoxville, 1992

Professor
Associate Dean for Undergraduate Education

Research Areas

Nanoparticle Technology, Synthesis of Nanowires and Nanotubes, Micropatterning, Protein Crystallization, Interfacial and Transport Phenomena

Selected Professional Activities

Engineering Advisory Council, Mississippi State University
Associate Editor, Journal of Nanomaterials, (2005 to present)
Associate Editor, Chemical Engineering Letters, (2007 to present)
Program Chair, Minority Division, ASEE (2011 and 2012 annual meetings)
Trustee of AIChE Foundation (2009 to present)
Member, External Advisor Board for RU (Rutgers University) FAIR ADVANCE project (2010 – present)

Selected Publications

Zhu, Q. L., Taylor, S. and Harris, M. T., "Evaluation of the Microstructure of Semicrystalline Solid Dispersions," *Molecular Pharmaceutics*, **7,** 1291-1300 (2010)

Lim, J. S., Kim, S. M., Lee, S. Y., Stach, E. A., Culver, J. N. and Harris, M. T., "Biogenic Aqueous-Phase Palladium Crystallization in the Absence of External Reducing Agents," *Nanoletters*, **10(10)**, 3863-3867 (2010)

Zhao, Y. Y., Hu, F., Evans, J. J. and Harris, M. T., "Study of Sol-Gel Transition in Calcium Alginate System by Population Balance Modeling," *Chemical Engineering Science*, **66(5)**, 848-858 (2011)

Lim, J.S., Kim, S.M., Lee, S.Y., Stach, E.A., Culver, J.N., "Surface Functionalized Silica as a Toolkit for Developing Aqueous Phase Palladium Mineralization on Thiol Moiety in the Absence of External Reducing Agents," *Journal of Colloids and Interface Science*, **DOI 10.1016**/j.jcis.(2010)12.064

Sung, P.F., Hsieh, Y.L., Taylor, L.S. and Harris, M. T., "Complex Dielectric Properties Measurements of Microcrystalline Cellulose (MCC) and Anhydrous Lactose Powders Using A Microwave-Based Open Reflection Resonator Sensor," *J. Pharmaceutical Sci*. (in press)

Selected Conference Presentations

Lim, J. S., Culver, J. N. and Harris, M. T., "Biogenic Aqueous-Phase Palladium Mineralization in the Absence of External Reducing Agents," paper 150f, AIChE Annual Meeting, November (2010)

Sung, P.F. and Harris, M. T., "Deposition Patterns from Drying Colloidal Suspension Drops," paper 174b, AIChE Annual Meeting, November (2010)

Zhu, Q., Harris, M. T. and Taylor, L., "Crystallization Behaviour and Structural Characterization of Drug/Polymer Solid Dispersions," paper 306a, AIChE Annual Meeting, November (2010)

Sung, P.F., Hwieh, Y.L., Taylor, L. and Harris, M. T., "Measurement of Dielectric Properties of Microcrystalline Cellulose (MCC)," paper 211g, AIChE Annual Meeting, November (2010)

Zhu, Q., Taylor L. and Harris, M. T., "Evaluation of the Microstructure of Semicrystalline Solid Dispersions," paper 253e, AIChE Annual Meeting, November (2010)

Zhu, Q., Taylor, L. and Harris, M. T., "Microstructure of Drug/Polymer Solid Dispersions," paper 571h, AIChE Annual Meeting, November (2010)

Oglesby, P. and Harris, M. T., "Modeling Electrokinetic Remediation of Concrete by G/FEM," paper 694e, AIChE Annual Meeting, November (2010)

Nancy W. Y. Ho

Ph. D., Purdue University, Molecular Biology

Research Professor
Senior Research Scientist and Group Leader of Molecular Genetics Group
Laboratory of Renewable Resources Engineering (LORRE)

Research Areas

Genetic engineering of the Saccharomyces yeast to convert sugars from cellulosic biomass to ethanol

Selected Publications

Bera, A.K., Ho, N. W. Y., Khan, A. and Sedlak, M., "A genetic overhaul of Saccharomyces cerevisiae 424A (LNH-ST) to improve xylose fermentation," *Journal of Industrial Microbiology & Biotechnology*, **38(5)**, 617-626 (2010)

Athmanathan, A., Sedlak, M., Ho, N. W. Y. and Mosier, N. S., "Effect of Product Inhibition on Xylose Fermentation to Ethanol in Glucose-Xylose co-fermenting S. cerevisiae 424A (LNH-ST)," *Biological Engineering*, **3(2)**, 111-124 (2011)

Selected Conference Presentations

Mosier, N.S., Sedlak, M. and Ho, N. W. Y., "Improving Acetic Acid and Ethanol Resistance of S. cerevisiae 424A (LNH-ST) during the Co-fermentation of Glucose and Xylose," 2010 AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Metabolic Engineering the Saccharomyces Yeast to Co-ferment Glucose and Xylose for Cost Effective Production of Renewable Fuels and Chemicals," Invited to present at Society For Industrial Microbiology Annual Meeting, New Orleans, LA, July (2011)

"An Overview of Yeast-Based Technologies for Ethanol Production from Cellulosic Materials," Invited to present at 27th Annual International Fuel Ethanol Workshop & Expo, Indianapolis, IN, June (2011)

"Recent Advances in Yeast-Based Technologies for Ethanol Production from Cellulosic Materials," Presented at the Sixth Frontier in Biofuels Conference, Invited to present at United States-Brazil Symposium on Sustainable Bioenergy (Purdue University's 6th Frontiers in Bioenergy Conference), Purdue University, West Lafayette, IN, May (2011)

"Technologies Are Ready For Cost-Effective Cellulosic Ethanol Production," Invited to Present at International Biomass Conference & Expo, St. Louis, MO, May (2011)

Sangtae Kim

Ph. D., Princeton, 1983

Donald W. Fedderson Distinguished Professor (on leave)

Member, National Academy of Engineering

Research Areas

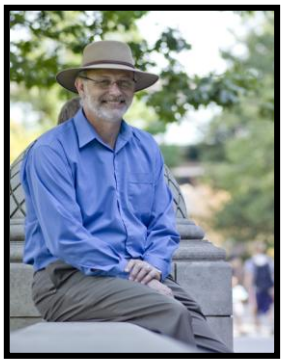
Pharmaceutical Informatics: Bioinformatics, Cheminformatics, Systems Biology; Computational Microfluidics and Nanofluidics; Radio Frequency Identification (RFID) and Enabling Information Technologies

Selected Professional Activities

FDA Science Board Working Group, Chair – IT Subgroup
Vice Chair, World Technology Evaluation Center (WTEC)

Advisory Boards (academic):

Dept. of Chemical Engineering, University of California Santa Barbara
College of Engineering, Illinois Institute of Technology
National University of Singapore, Graduate School Integrative Studies Program
Dept. of Chemical Engineering, Tennessee Tech. University



James D. Litster

Ph. D., University of Queensland, 1985

Professor of Chemical Engineering and Industrial and Physical Pharmacy
Director of Graduate Studies, Chemical Engineering

Fellow, Australian Academy for Technological Sciences and Engineering - 2011

Research Areas

Particle Design and Formulation, Granulation and Agglomeration, Crystallization of Bioactives, Engineering Education

Selected Professional Activities

Honorary Professor, The University of Queensland
Member, Solae LLC (St Louis) Scientific Advisory Board
Fellow, Institution of Chemical Engineers (UK)
Consultant, International Fine Particle Research Institute
Editorial Board, Particle and Particulate Systems Characterisation (2003- present)
Editorial Board, AAPS Pharmaceutical Science and Technology (2009-present)
Chair, Science Foundation of Ireland Review Panel for Solid State Pharmaceuticals Cluster SRC, September 2010.
International Organizing Committee, 6th World Congress on Particle Technology, Nurnberg, Germany, 2010 (and conference session chair).
Member, National Institute of Pharmaceutical Technology and Education (NIPTE) Faculty Committee

Selected Publications

Smith, R.M., Liu, L.X. and Litster, J.D., "Breakage of drop nucleated granules in a breakage only high shear mixer," *Chemical Engineering Science*, **65**, 5651–5657, (2010)

Emady, H., Kayrak-Talay, D., Schwerin, W. and Litster, J.D., "Granule Formation Mechanisms and Morphology from Single Drop Impact on Powder Beds," *Powder Technology* (in press)

Li, J., Freireich, B., Wassgren, C. and Litster, J.D., "A General Compartment-based Population Balance Model for Particle Coating and Layered Granulation," *AIChE J*. (in press)

Kayrak-Talay, D. and Litster, J.D. "A priori Performance Prediction in Pharmaceutical Wet Granulation: Testing the Applicability of the Nucleation Regime Map to a Formulation with a Broad Size Distribution and Dry Binder Addition," *International Journal of Pharmaceutics* (in press)

Freireich, B., Li, J., Litster, J.D., Wassgren, C., "A compartmental approach to studying particle motion in mixers using discrete element modeling," *Chemical Engineering Science* (in press)

Selected Conference Presentations

Keynote: "Design and manufacture of Delivery forms for Small Particles NAS Workshop on Challenges in Characterising Small Particles," Washington DC, October (2010)

Rashid, A., White, E.T., Howes, T., Litster, J.D. and Marziano, I., "Growth rates of ibuprofen crystals grown from ethanol," Proceedings Chemeca, Adelaide, September, (2010)

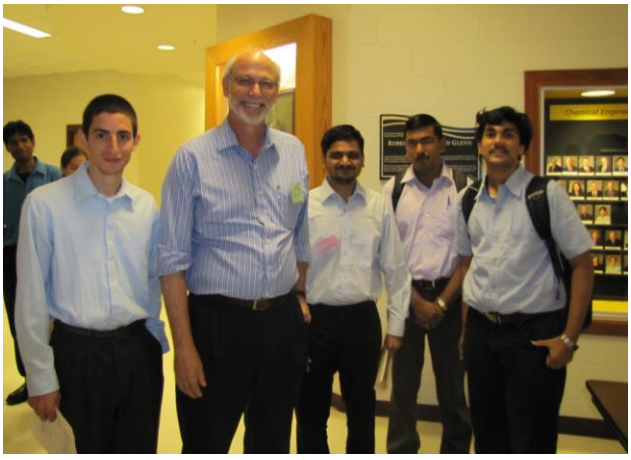
Kayrak-Talay, D., Emady, H.N. and Litster, J. D., "Quantifying the Effect of Process Conditions on Liquid Impact on Powder Beds towards Granule Formation," AIChE Annual Meeting, November (2010)

McCann, R., Muliadi, A., Litster, J. and Pinal, R., "Using Roll Compaction in a Continuous Tablet Manufacturing Process," AIChE Annual Meeting, November (2010)

Muliadi, A., Wassgren, C. and Litster, J., "Modeling the Roll Compaction Process using Finite Element Analysis," AIChE Annual Meeting, November (2010)

Li, J., Freireich, B., Wassgren, C. and Litster, J., "The Simulation of a Spray Coating Process unising Compactemtnal Based Population Balance Model," AIChE Annual Meeting, November (2010)

McCann, R., Muliadi, A., Paaso, J., Litster, J. and Pinal, R., "ON-line monitoring of Roller Compaction Ribbon Density using NIR Spectroscopy," AIChE Annual Meeting, November (2010)



Julie C. Liu

Ph. D., Caltech, 2006

Assistant Professor
3M Non-tenured Faculty Award

Research Areas
Biomaterials, Tissue Engineering, Protein Engineering

Professional Activities

American Institute of Chemical Engineers

- Women's Initiatives Committee, vice chair, November 2009 – November 2010
- Session co-chair, Naturally-Derived Biomaterials, November 8, 2010
- Session chair, Tissue Engineering Microenvironment, November 9, 2010
- Women's Initiatives Committee, chair, November 2010 – November 2011
- Engineering Fundamentals in Life Science (Area 15d/e), 2nd vice chair, November 2010 – November 2011

Society for Biomaterials

- Annual Meeting abstract reviewer for Biomimetics and Responsive Biomaterials: Exploiting Biological Signals, Dec 2010
- Symposium co-organizer, Strategies to Promote Vascularization of Tissue-engineered Constructs, April 2011
- Panel co-organizer, Exploring Alternative Careers in Biomaterials Student Luncheon, April 2011

Materials Research Society

- Symposium co-organizer, Engineering Polymers for Stem-Cell-Fate Regulation and Regenerative Medicine

NSF review panel

Selected Invited Lectures

"Peptide-based Cues for Adult Stem Cell Differentiation in Cartilage Graft Applications," Chemical Engineering, University of Illinois at Urbana-Champaign, (UIUC), March (2011)

Selected Publications

Jones, M.D., Liu, J.C., Barthel, T.K., Hussain, S., Lovria, E., Cheng, D., Schoonmaker, J.A., Mulay, S., Ayers, D.C., Bouxsein, M.L., Stein, G.S., Mukherjee, S. and Lian, J.B., "A Proteasome Inhibitor, Bortezomib, Inhibits Breast Cancer Growth and Reduces Osteolysis by Downregulating Metastatic Genes," *Clinical Cancer Research*, **16**, 4978-4989 (2010)

Selected Conference Presentations

Kadrmas, J.M. and Liu, J.C., "Peptide-Based Cues for Mesenchymal Stem Cell Differentiation into Cartilage Graft Applications," annual meeting of PIs in the NSF's BRIGE program, Arlington, VA, August (2010)

Galas, R. and Liu, J.C., "Producing and Characterizing Vascular-Endothelial-Growth-Factor-Modified Surfaces," Biomaterials Day, sponsored by the Society for Biomaterials and co-organized by Case Western Reserve University, University of Kentucky, and Purdue University, Cleveland, OH. Session B: Cell Material Interactions, November (2010)

Renner, J.N. and Liu, J.C., "Material-based Cues that Influence Mesenchymal Stem Cell Differentiation to Cartilage," Biomaterials Day, sponsored by the Society for Biomaterials and co-organized by Case Western Reserve University, University of Kentucky, and Purdue University, Cleveland, OH, Session D: Orthopedics, November (2010)

Su, S-C and Liu, J.C., "Modular Protein-based Materials with Tunable Mechanical Properties," Biomaterials Day, sponsored by the Society for Biomaterials and co-organized by Case Western Reserve University, University of Kentucky, and Purdue University, Cleveland, OH., Poster session, November (2010)

Kadrmas, J.M. and Liu, J.C., "Characterization of Modular Resilin-based Artificial Protein Scaffolds for Cartilage Tissue Engineering," annual meeting of the American Institute of Chemical Engineers, Salt Lake City, UT. Session 114: Naturally-Derived Biomaterials, 114a, November (2010)

Kadrmas, J.M. and Liu, J.C., "Bioactive Peptides for Mesenchymal Stem Cell Differentiation in Cartilage Tissue Engineering," annual meeting of the American Institute of Chemical Engineers, Salt Lake City, UT. Session 178: Stem Cells in Tissue Engineering II, 178c, November (2010)

Liu, J.C., "Resilin-based Recombinant Proteins for Cartilage Engineering," Deutsche Forschungsgemeinschaft-National Science Foundation (DFG-NSF) research conference on Bioinspired Design and Engineering of Novel Functional Materials, New York, NY., Poster session, March (2011)

Renner, J.N. and Liu, J.C., "Material-based Cues that Influence Mesenchymal Stem Cell Differentiation to Cartilage," annual meeting of the Society for Biomaterials, Orlando, FL., Poster session, April (2011)

Renner, J.N. and Liu, J.C., "Material-based Cues that Influence Mesenchymal Stem Cell Differentiation to Cartilage," Materials Research Society spring meeting. Symposium PP: Engineering Polymers for Stem-cell-fate Regulation and Regenerative Medicine, April (2011)

John A. Morgan

Ph. D., Rice, 1999

Associate Professor

Research Areas: Metabolic Engineering, Biocatalysis

Selected Professional Activities

Associate Editor, Bioprocess and Biosystems Engineering
Invited Site Reviewer for Singapore's A*STAR program
Programming Chair A.I.Ch.E. National Meeting Division 15 (2011)
Reviewer for the Consortium for Plant Biotechnology Research, Inc
Review Panel, NSF CBET division
Review Panel, DOE-ARPA-E
Review Panel, DOE- Young Investigator Program

Selected Invited Lectures

"Determination of metabolic fluxes in photosynthetic organism," Chemical Engineering, Cornell University, September (2010)

Selected Publications

Sengupta, N., Rose, S. and Morgan, J.A., "C Flux analysis of CHO cell metabolism in non growth phase for recombinant protein production," *Biotechnology and Bioengineering*, **108**: 82-92 (2011)

O'Grady, J. and Morgan, J.A., "Heterotrophic growth and lipid production of Chlorella protothecoides on glycerol," *Bioprocess and Biosystems Engineering*, **34**:121-125 (2011)

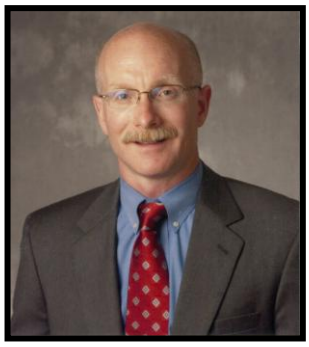
Boyle, N. and Morgan, J.A., "Computation of metabolic fluxes and efficiencies for biological carbon dioxide fixation," *Metabolic Engineering* (**available online**) (2011)

Selected Conference Presentations

Morgan, J.A., "Simultaneous growth of Chlorella protothecoides on glycerol and glucose," International Conference on Biomass and Energy Technologies, Beijing, China, (2010)

Hsu, S.-H., Patkar, P.R., Venkatasubranium, V. and Morgan, J.A., "Addition of Carbon fixation pathways increase the theoretical heterotrophic yield of acetate," 4th International Conference on Computational Systems Biology, Suzhou, China, (2010)

O'Grady, J. and Morgan, J.A., "Glycerol Is an Effective Substrate for Biodiesel Production in a Heterotrophic Algae," AIChE Annual Meeting, Salt Lake City, UT, (2010)



Joseph F. Pekny

Ph. D., Carnegie Mellon University, 1989

Professor
Interim Head, School of Industrial Engineering (until December, 2010)

Research Areas

Systems analysis; combinatorial optimization; supply chain mangement, planning and scheduling systems; pharmaceutical pipeline management; model-based and data driven management; systems analysis and decision models in healthcare engineering, real-time decision systems

Selected Professional Activities

Member of the Purdue Global Policy Research Institute
Co-Leader of the Systems Engineering Task Force/Systems of Systems Institute Working Group for the College of Engineering
Technical Advisor – Advanced Process Combinatorics, Inc.
Advisory Board Member, VA Center of Excellence on Implementing Evidence Based Practice, Roudebush VA Hospital

Selected Invited Lectures

"Large Scale Infinite Dimensional Programming for Design and Analysis of Biologics Facilities," Genzyme Corporation/Engineering, Manufacturing, and Modeling Leadership Team Presentation (approximately 20 executives and engineering technical fellows/engineers), August (2010)

"The Business of Plugging in Electric Vehicle Conference," invited presentation and panel on the academic-industrial partnerships in the future of electric vehicles, Center for Automotive Research, Detroit, MI, October (2010)

"Mathematical Programming Methods for Operations Planning and Scheduling," (approximately 30 engineers, scientists, and staff), Bristol Myers Squibb/Syracuse, April (2011)

Selected Publications

Huang, S., Hodge, B., Taheripour, F., Pekny, J., Reklaitis, G. and Tyner, W., "The effects of electricity pricing on PHEV competitiveness, EnergyPolicy, **doi:10.1016**/*j.enpol*. 2010.12.029, (2011)

Hodge, B.-M., Shukla, A., Huang, S., Reklaitis, G., Venkatasubramanian, V. and Pekny, J., "A Multi-Paradigm Simulation of the Effects of PHEV Adoption on Electric Utility Usage Levels and Emissions," *Industrial & Engineering Chemistry Research* (in press)

Selected Conference Presentations

Hodge, B.-M., Zeiler, A., Brooks, D., Blau, G., Pekny, J. and Reklaitis, G., "Improved Wind Power Forecasting with ARIMA Models," To appear in the Proceedings of the 21st European Symposium on Computer Aided Process Engineering, Chalkidiki , Greece, May 29 – June 1 (2011)

Huang, S., Hodge, B.-M., Xiao, J., Pekny, J. and Reklaitis, G., "The Effects of Electricity Storage on Large Scale Wind Integration," To appear in the Proceedings of the 21st European Symposium on Computer Aided Process Engineering, Chalkidiki , Greece, May 29 – June 1 (2011)

Xiao, J., Hodge, B.-M., Liu, A., Pekny, J. and Reklaitis, G., "Long-Term Planning of Wind Farm Siting in the Electricity Grid," To appear in the Proceedings of the 21st European Symposium on Computer Aided Process Engineering, Chalkidiki , Greece, May 29 – June 1 (2011)

R. Byron Pipes

Ph. D., University of Texas – Arlington, 1972

John Leighton Bray Distinguished Professor
Director, Purdue Institute for Defense Innovation

Member, National Academy of Engineering

Research Areas

Application of nanotechnology to engineering disciplines including aerospace, composite materials and polymer science and engineering

Selected Professional Activities

Fellow, American Society of Mechanical Engineers
Fellow, Society for Advanced Materials and Process Engineering
Fellow, American Society of Composites
Member, NRC Committee Panel on Building and Fire Research
Session Chair ASC Conference – Dayton, OH
Member, Army Research Laboratory Technical Assessment Board, 2011-2013
Member, NASA Glenn Polymer Branch Review Team, 2011-2012

Selected Publications

Ritchey, A., Dustin, J., Gosse, J. and Pipes, R.B., "Self-Consistent Micromechanical Enhancement of Continuous Fiber Composites," *Advances in Composites*, *INTEC Publications*, (2011)

Courter, J., Dustin, J.S., Ritchey, A. and Pipes, R.B., "Properties of an Out-of-Autoclave Prepreg Material: Oven Versus Autoclave," *Advanced Materials*, (in press)

Jasso, A. J. M., Goodsell, J.E., Pipes, B.R. and Koslowski, M., "Validation of Strain Invariant Failure Analysis in an Open Hole Off-Axis Specimen," *Journal of Materials*, **Vol. 63** No. 9, (2011)

Doraiswami Ramkrishna

Ph. D., University of Minnesota, 1965

H. C. Peffer Distinguished Professor
Member, National Academy of Engineering
Purdue College of Engineering Mentoring Award, 2010
Purdue College of Engineering, Team Award, 2010

Research Areas

Applied Mathematics, Dispersed phase systems, Biochemical engineering, Chemical reaction engineering

Selected Professional Activities

Member Advisory Council, Pacific Northwest National Laboratory, Richland, WA

Selected Invited Lectures

"Nonlinear Phenomena in Metabolic Systems," Session in Honor of Roger Schmitz, Paper #154b, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Reaction Engineering Concepts in Metabolic Modeling," ACS I&EC Fellow Award session for A. Varma, Anaheim, CA, March (2011)

"The Cybernetic Approach to Metabolic Modeling, State of the Art and Relationship to Others," AIChE Webinar, April (2011)

Selected Publications

Chakraborty, J., Singh, M., Ramkrishna, D., Borchert, C. and Sundmacher, K., "Modeling of Morphology Distributions Towards Crystals with Preferred Asymmetry," *Chem. Eng. Sci*., **65**, 5676-5686 (2010)

Song, H.-S. and Ramkrishna, D., "Cybernetic Models based on Lumped Elementary Modes Accurately Predict Metabolic Function of Multiple Strains," *Biotechnol. & Bioeng*., 127-140, (2011)

Franz, A., Song, H.-S., Ramkrishna, D. and Kienle, A., "Modeling and nonlinear analysis of Cupriavidus necator metabolism including Poly (hydroxybutyrate) synthesis and degradation: Incorporation of internal metabolites with slow dynamics into hybrid cybernetic modeling," *Biochemical Journal* (in press)

Chakraborty, J. and Doraiswami Ramkrishna, "Population balance modeling of environment dependent breakage: role of granular viscosity, density and compaction: Model formulation and similarity analysis," *Ind. Eng. Chem*. (in press)

Selected Conference Presentations

Chakraborty, J., Singh, M. R. and Ramkrishna, D., "Morphological population balance modeling of faceted crystals with large number of faces: the division of internal coordinate space into dynamic and invariant coordinates," 4th International Conference on Population Balance Modeling, Berlin, Germany, September (2010)

Che-Chi, S., Ramkrishna, D., Chatterjee, A. and Hu, W.-S., "On modeling transfer of drug resistance with population balances," 4th International Conference on Population Balance Modeling, Berlin, Germany, September (2010)

Chatterjee, A., Johnson, C. M., Shu, C.-C., Kaznesis, Y., Ramkrishna, D., Dunny, G.M. and Hu, W.-S., "A Bistable Switch Controls Drug Resistance in Enterococcus faecalis via Antisense RNA, Transcriptional Interference: An In-Silico and In-Vivo Approach," Paper #105e, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Singh, M. R., Chakraborty, J. and Ramkrishna, D., "Population Balance Modeling of Morphology Distributions of Asymmetric Crystals," Paper # 141g, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

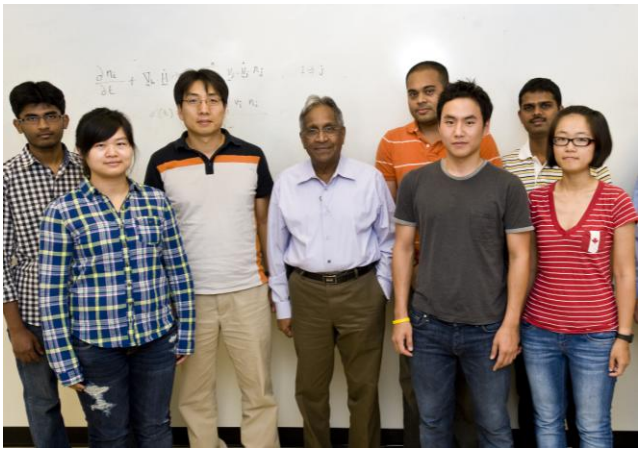
Jun, G., Song, H.-S., Ramkrishna, D. and Yuan, J., "Cofermentation of Mixed Sugars to Bioethanol with Single and Multiple Yeast Strains: Model Development," Paper #378ea, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

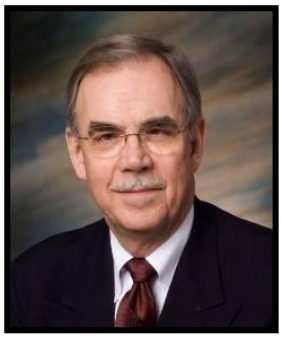
Song, H.-S. and Ramkrishna, D., "Dynamic Behavior of Knockout Strains Predicted from Limited Data on Wild-Type," Paper #441f, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Shu, C.-C., Ramkrishna, D., Chatterjee, A. and Hu, W.-S., "Modeling Drug Resistance, a Quorum Sensing System, with Population Balance," Paper #651a, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Singh, M. R., Chakraborty, J., Ramkrishna, D., Boerichter, S. X. M., Borchert, C. and Sundmacher, K., "Morphological Measurements of Faceted Crystals Using Image Analysis," Paper #668c, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Sowbna, P. R., Yadav, G. D. and Ramkrishna, D., "Modeling of Mandelic Acid from Benzaldehyde by Phase Transfer Catalysis," Paper #730g, AIChE Annual Meeting, Salt Lake City, UT, November (2010)





Gintaras V. "Rex" Reklaitis

Ph. D., Stanford University, 1969

Burton and Kathryn Gedge Distinguished Professor

Member, National Academy of Engineering
Co-director, Pharmaceutical Technology & Education Center
Deputy Director, NSF ERC on Structured Organic Composites

George Lappin Award, National Program Committee, AIChE (2010)

Research Areas

Process systems engineering, design and operation of batch/semicontinuous systems, enterprise-wide modeling and optimization, applications to pharmaceutical product development, process design and manufacturing

Selected Professional Activities

US National Academy of Engineering, Section 3 Peer Committee, 2010-2012
AIChE Foundation, Board of Trustees, 2010-2012
Smart Process Manufacturing, Steering Committee, NSF EVO, 2007- present
National Institute for Pharmaceutical Technology & Education, Purdue representative, 2005- present
Editorial Advisory Boards

- Computers & Chemical Engineering
- Journal of Pharmaceutical Innovation
- Computer Applications in Engineering Education
- Journal of Process Systems Engineering

Selected Invited Lectures

"Progress and Prospects for the ERC on Structured Organic Particulate Systems," University of Kentucky, Department of Chemical and Materials Engineering, October (2010)

"Progress and Prospects for the ERC on Structured Organic Particulate Systems," Vanderbilt University, Department of Chemical and Biomolecular Engineering, March (2011)

"Process Systems Engineering in Pharmaceutical Product Development and Manufacture," Session in Honor of Tom Edgar's 65th Birthday, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Selected Publications

Hamdan, I., Venkatasubramanian V. and Reklaitis,G.V., "Exceptional Events Management applied to Roller Compaction of Pharmaceutical Powders," *J. Pharmaceutical Innovation* 5, **No 4**, 147-160, (2010)

Lainez, J.M., Reklaitis, G.V. and Puigjaner, L., "Linking marketing and supply chain models for improved business strategic decision support," *Comput. & Chem Engr*, **34**, 2107-2117, (2010)

Akkisetty, P.K., Lee, U., Reklaitis G. V. and Venkatasubramanian, V., "Population Balance Model-based Hybrid Neural Network for a Pharmaceutical Milling Process," J. *Pharmaceutical* Innovation 5, **No 4**, 161-168, (2010)

Reklaitis, G.V., Khinast, J., Muzzio, F. J., "Pharmaceutical engineering science—New approaches to pharmaceutical development and manufacturing," *Chem Eng Science*, **65**, No. 21, Pages iv-vii, Introduction to Special Issue (2010)

Huang, S., Hodge, B.-M., Taheripour, F., Reklaitis, G.V., Pekny, J. and Tyner, W., "The Effects of Electricity Pricing Structure on the Competitiveness of Plug-In Hybrid Electric Vehicles in the California Market," *Energy Policy*, **39** 1552–1561, (2011)

Yi, G. and Reklaitis, G.V., "Optimal Design of Multiperiod Batch-Storage Network including Transportation Processes," *AIChE J* (DOI 10.1002/aic.12492) (2010)

Lainez, J.M., Blau, G., Mockus, L., Orcun, S. and Reklaitis, G.V., "Pharmacokinetic Based Design of Individualized Dosage Regimens using A Bayesian Approach," *I&EC Research* (doi: 10.1021/ie101610r), (2011)

Hodge, B.-M., Shukla, A., Huang, S., Reklaitis, G.V., Venkatasubramanian, V. and Pekny,J, "A Multi-Paradigm Modeling Simulation of the Effects of PHEV Adoption on Electric Utility Usage Levels and Emissions," *I&EC Research* (2011) (in press)

Xiao, J., Hodge, B-M, Pekny, J.F. and Reklaitis, G.V., "Operating Reserve Policies with High Wind Power Penetration," *Comput. & Chem Engr*, (doi: 10.1016/ j.compchemeng.2011.03.004) (on-line), (2011)

Khinast, J., Muzzio, F. and Reklaitis, G.V., (eds), Special Issue: Pharmaceutical Engineering Science, *Chem. Eng. Science* **65**, No.21, 5625-5780 (2010)

Selected Conference Presentations

"Facilitating Continuous Production in the Pharma Industry with Real-Time Process Management and Ontological Informatics," paper 383e, AIChE Annual Meeting, Salt lake City, UT, November (2010)

"Exceptional Events Management for continuous Pharmaceutical Manufacturing: Feeder, Blender and Roller compactor in Series," paper 444b, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Fabio H. Ribeiro

Ph. D., Stanford University, 1989

Professor
Purdue University Faculty Scholar (2006 – 2011)

Research Areas
Surface Science and Kinetics of Heterogeneous Catalytic Reactions

Selected Professional Activities

Member of the Editorial Board, Applied Catalysis B: Environmental
Member of the Editorial Board, Catalysis Letters
Past-chair, Catalysis and Reaction Engineering Division AIChE (2011)
Chair of the Catalysis and Reaction Engineering Division AIChE (2010)
Editor, Journal of Catalysis

Selected Invited Lectures

"Water-gas shift on Au and Pt: A simple reaction that is not simple to quantify", Dinner speaker at the Michigan Catalysis Society, Livonia, MI, December 8th, 2010

Selected Publications

Smeltz, A. D., Delgass, W. N. and Ribeiro, F. H. "Oxidation of NO with O2 on Pt (111) and Pt (321) large single crystals," *Langmuir*, **26(21)**, 16578–16588 (2010)

Chen, N., Rioux, R. M., Barbosa, L. A. M. M. and Ribeiro, F. H., "Kinetic and Theoretical Study of the Hydrodechlorination of CH4-xClx (x = 1-4) Compounds on Palladium," *Langmuir*, **26(21)**, 16615–16624, (2010)

Williams, W. D., Shekhar, M., Lee, W.S., Kispersky, V. F., Delgass, W. N., Ribeiro, F. H. Kim, S.M., Min Stach, E. A., Miller, J. T. and Allard, L. F., "Metallic Corner Atoms in Gold Clusters Supported on Rutile are the Dominant Active Site during Water-Gas Shift Catalysis," *Journal of the American Chemical Society*, **132**, 14018–14020 (2010)

Kim, S. H., Ribeiro, F. H. and Rioux, R.M., "Preface to the Molecular Surface Chemistry and Its Applications Special Issue," *Langmuir*, **26(21)**, 16187–16189, (2010)

Selected Conference Presentations

Ribeiro, F. H., Abu-Omar, M. M., Agrawal, R., Nicholas C., Delgass, N.W. and McCann, M.C., "Maximizing conversion of biomass carbon to liquid fuel," The 240th ACS National Meeting, Boston, MA, August (2010)

Williams, D., Shekhar, M., Kispersky, V., Lee, W.-S., Kim, S.M., Ribeiro, F., Miller, J., Stach, E. and Delgass, N., "Water gas shift reaction over supported gold nanoparticles", The 240th ACS National Meeting, Boston, MA, August (2010)

Chaugule, S. S., Kispersky, V. F., Ratts, J. R., Yezerets, A., Currier, N. W., Ribeiro, F. H. and Delgass, W. N., "NO_x Storage and Reduction on Pt/BaO/γ-Al_2O_3," Gordon Research Conference Catalysis, NH. July (2010)

Shekhar, M., Williams, W. D., Lee, W. S., Delgass, W. N., Ribeiro, F. H., Kim, S. M., Stach, E. A., Miller, J. T. and Allard Jr, L. F., "Corner Atoms are Active Sites for Nanoparticle Gold Water-Gas Shift Catalysts ," 2010 Gordon Research Conference - Catalysis,Colby-Sawyer College, New London, NH, July (2010)

Fingland, B. R., Dietrich, P. J., Ribeiro, F. H., Guo, N., Dumesic, J. A. and Miller, J. T., "Liquid phase operando X-ray absorption spectroscopy (XAS): Glycerol reforming over a PtMo/C catalyst," The 240th ACS National Meeting, Boston, MA, August (2010)

Wang, J., Delgass, N. W. and Ribeiro, F. H., "Development of an operando transmission Fourier Transform Infrared (FTIR) catalysis reactor system and investigation of a steady state isotopic transient kinetic analysis on water gas shift (WGS) reaction," The 240th ACS National Meeting, Boston, MA, August (2010)

Lee, W.-S., Ribeiro, F. H., Delgass, N. W., "Effects of Preparation Conditions on Au/TS-1 for Gas Phase Propylene Epoxidation," AIChE National Meeting, Salt Lake City, UT, November (2010)

Mallapragada, D., Delgass, N. W., Ribeiro, F. H. and Agrawal, R., "The Scope of Using Concentrated Solar Energy to Produce Liquid Fuels from Biomass," AIChE National Meeting, Salt Lake City, UT, November (2010)

Kispersky, V., Chaugule, S. S., Yezerets, A., Currier, N. W., Ribeiro, F. H. and Delgass, N. W., "Formation and Removal of Ba-Carbonates/Carboxylates on Pt/Ba/Al2O3 Lean Nox Traps," AIChE National Meeting, Salt Lake City, UT, November (2010)

Pazmiño, J. H., Miller, J. T., Mulla, S. S., Delgass, N. W. and Ribeiro, F. H., "Kinetic studies of the stability of Pt for NO oxidation: Effect of sulfur and long term aging," *Journal of Catalysis*, **282**, 13–24, (2011)

Chaugule, S. S., Kispersky, V. F., Ratts, J. L., Yezerets, A., Currier, N. W., Ribeiro, F. H. and Delgass, N. W., "Formation and Removal of Ba-Carbonates or Carboxylates on Pt/BaO/ -Al_2O_3 Lean NOx Traps," *Applied Catalysis B: Environmental*, **107**, 26-33, (2011)

Lee, W-S., Zhang, R., Akatay, M. C., Baertsch, C., Stach, E., Ribeiro, F. H. and Delgass, N. W., "Differences in Catalytic Sites for CO Oxidation and Propylene Epoxidation on Au Nanoparticles," *ACS Catalysis **1***, 1327–1330, (2011)

Kendall T. Thomson

Ph. D., University of Minnesota, 1999

Associate Professor

Purdue University Faculty Scholar (2008-2013)

Shreve Teaching Award 2010

Research Areas

Computational Catalysis Design, Computer-Aided Design of Nanoporous Materials, Ab Initio Molecular Dynamics, Molecular Electronics, Modeling Nano- and Mesoporous Materials

Arvind Varma

Ph. D., Minnesota, 1972

R. Games Slayter Distinguished Professor
Head, School of Chemical Engineering

Elected Foreign Member, Academy of Engineering, Mexico 2010
Elected Fellow, American Association for the Advancement of Science, 2011
Elected Fellow, Industrial & Engineering Chemistry Division, American Chemical Society, 2011
Leadership Award, College of Engineering, Purdue University, 2011

Research Areas: Chemical and Catalytic Reaction Engineering, New Energy Sources, Synthesis of Advanced Materials

Selected Professional Activities

Series Editor, Cambridge Series in Chemical Engineering, Cambridge University Press
Member of Editorial Board, International Journal of Petroleum Science and Technology
Member of Editorial Board, Industrial & Engineering Chemistry Research
Member, AIChE Awards Solicitation Committee
Chair, Session in honor of Roger Schmitz' 75th Birthday, 2010 AIChE Annual Meeting,

Selected Invited Lectures

Department of Chemical Engineering, Columbia University, New York, NY, October (2010)
Induction Lecture, Academy of Engineering, Mexico, November (2010)
Department of Chemical Engineering, Georgia Institute of Technology, Atlanta, GA, December (2010)
Department of Chemical Engineering, Vanderbilt University, Nashville, TN, February (2011)

Selected Publications

Hu, W., Knight, D., Lowry, B. and Varma, A., "Selective Oxidation of Glycerol to Dihydroxyacetone over Pt-Bi/C Catalyst: Optimization of Catalyst and Reaction Conditions," *Industrial & Engineering Chemistry Research*, **49**, 10876-10882 (2010)

Hwang, H. T., Al-Kukhun, A. and Varma, A., "Hydrogen for Vehicle Applications from Hydrothermolysis of Ammonia Borane: Hydrogen Yield, Thermal Characteristics, and Ammonia Formation," *Industrial & Engineering Chemistry Research*, **49**, 10994-11000 (2010)

Diwan, M., Hwang, H.T., Al-Kukhun, A. and Varma, A., "Hydrogen Generation from Noncatalytic Hydrothermolysis of Ammonia Borane for Vehicle Applications," *AIChE Journal*, **57**, 259-264 (2011)

Al-Kukhun, A., Hwang, H. T. and Varma, A., "A Comparison of Ammonia Borane Dehydrogenation Methods for PEM Fuel Cell Vehicles: Hydrogen Yield, Ammonia Formation and its Removal," *Industrial & Engineering Chemistry Research*, **50**, 8824-8835 (2011)

Hu, W., Lowry, B. and Varma, A., "Kinetic Study of Glycerol Oxidation Network over Pt-Bi/C Catalyst," *Applied Catalysis B: Environmental*, **106**, 123-132 (2011)

Wankat, P. and Varma, A., "Purdue's Doraiswami Ramkrishna – A Population of One," *Chemical Engineering Education*, **45 (1)**, 8-14 (2011)

Varma, A. and Luss, D., "Neal Amundson: ChE Educator, Researcher and Leader Par Excellence," *Chemical Engineering Progress*, **107** (4), 51 (2011)

Selected Conference Presentations

"Roger Schmitz: The Quintessential Academic," AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Hydrogen Generation from Thermolysis of Neat Ammonia Borane for On-Board Vehicle Applications," AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Ammonia Borane Dehydrogenation Always Generates Ammonia, How Much and How to Remove It?" AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"Kinetic Study of Glycerol Oxidation over Pt-Bi/C catalyst," AIChE Annual Meeting, Salt Lake City, UT, November (2010)

"New Methods to Generate Hydrogen from Boron Compounds and Water for Fuel Cell Applications," 8th Tactical Power Sources Summit, Washington, DC, January (2011)

"Neal R. Amundson: His Chief Contributions to the Development of Chemical Reaction Engineering," University of Houston, Houston, TX, March (2011)

"Purdue Hydrogen Systems Laboratory," 2011 DOE Hydrogen Program, Annual Merit Review and Peer Evaluation Meeting, Washington, DC, May (2011)

"Kinetic Study of Glycerol Oxidation Network over Pt-Bi/C Catalyst," North American Meeting of the Catalysis Society, Detroit, MI, June (2011)

Intellectual Property

"Ammonia Removal for Hydrogen PEM Fuel Cells," A. Al-Kukhun, H.T. Hwang and A. Varma, Invention Disclosure, filed on May 10, 2011

"High and Rapid Hydrogen Release from Thermolysis of Ammonia Borane near PEM Fuel Cell Operating Temperatures," H.T. Hwang, A. Al-Kukhun and A. Varma, Invention Disclosure, filed on May 10, 2011

Venkat Venkatasubramanian

Ph. D., Cornell, 1984

Reilly Professor
Professor of Industrial and Physical Pharmacy (Courtesy)

AIChE Fellow, 2011
Research Excellence Award, College of Engineering, 2011

Research Areas

Pharmaceutical Informatics, Abnormal Events Management and Process Safety, Discovery Informatics for Molecular Products Design, Systems Biology, Complex Adaptive Systems, Artificial Intelligence, Artificial Life, Statistical Mechanics

Selected Professional Activities

Editor, Computers and Chemical Engineering
Program Chair, Computing and Systems Technology (CAST) Area 10E, Information Technology, 2010

Selected Invited Lectures

"Abnormal Events Management in Complex Engineered Systems," University of California, Berkeley (EECS Department), February (2010)

Selected Publications

Hsu, S.–H., Reklaitis, G.V., and Venkatasubramanian, V., "Modeling and Control of Roller Compaction for Pharmaceutical Manufacturing, Part I: Process Dynamics and Control Framework", *Journal of Pharmaceutical Innovation*, *5*(1-2), pp. 14-23 (2010)

Hsu, S.–H., Reklaitis, G.V. and Venkatasubramanian, V., "Modeling and Control of Roller Compaction for Pharmaceutical Manufacturing, Part II: Control System Design", *Journal of Pharmaceutical Innovation*, 5(1-2), pp. 24-36 (2010)

Sesen, M.B., Suresh, P., Banares-Alcantara, R., and Venkatasubramanian**, V.,** "An Ontological Framework for Automated Regulatory Compliance in Pharmaceutical Manufacturing", *Comp. Chem. Eng*., 34 (7), pp. 1155-1169 (2010)

Maurya, M.R., Paritosh, P.K., Rengaswamy, R. and Venkatasubramanian, V., "A Framework for On-Line Trend Analysis", *Engineering Applications of Artificial Intelligence, in press*, 23(6), pp. 950-960 (2010)

Suresh, P., Hsu, S.–H., Akkisetty, P., Reklaitis, G.V. and Venkatasubramanian, V., "Onto MODEL: Ontological Mathematical Modeling Knowledge Management in Pharmaceutical Product Development. 1: Conceptual Framework", *Ind. Eng. Chem. Res.*, 49 (17), pp. 7758–7767 (2010)

Suresh, P., Hsu, S.–H., Akkisetty, P., Reklaitis, G.V. and Venkatasubramanian, V., "Onto MODEL: Ontological Mathematical Modeling Knowledge Management in Pharmaceutical Product Development 2: Applications", *Ind. Eng. Chem. Res.*, 49 (17), pp. 7768–7781 (2010)

Hailemariam, L. and Venkatasubramanian, V., "Purdue Ontology for Pharmaceutical Engineering: Part I. Conceptual Framework", *Journal of Pharmaceutical Innovation*, 5(3), pp. 88-99 (2010)

Hailemariam, L. and Venkatasubramanian, V., "Purdue Ontology for Pharmaceutical Engineering: Part II. Applications", *Journal of Pharmaceutical Innovation*, 5(4), pp. 139-146 (2010)

Hamdan, I., Reklaitis, G.V., Venkatasubramanian, V., "Exceptional Events Management Applied to Roller Compaction of Pharmaceutical Powders", *Journal of Pharmaceutical Innovation*, 5(4), pp. 147-160 (2010)

Akkisetti, V.P.K., Lee, U., Reklaitis, G.V. and Venkatasubramanian, V., "Population Balance Model-based Hybrid Neural Network for a Pharmaceutical Milling Process", *Journal of Pharmaceutical Innovation*, 5(4), pp. 161-168 (2010)

Venkatasubramanian, V., "Systemic Failures: Challenges and Opportunities in Risk Management in Complex Systems, *Perspective article, AIChE J*., 57(1), pp. 2-9 (2011) (Invited paper)

Shukla, A., Agarwal. V.L. and Venkatasubramanian, V., "Optimizing Efficiency-Robustness Trade-offs in Supply Chain Design under Uncertainty Due to Disruptions", *International Journal of Physical Distribution & Logistics Management* (*in* press)

Maddipati, S., Nandigam, R., Kim, S., and Venkatasubramanian, V., "Learning the patterns in combinatorial protein libraries by Support Vector Machines," *Computers and Chemical Engg*. (in press)

Hodge, B.-M., Shukla, A., Huang, S., Reklaitis, G., Venkatasubramanian, V. and Pekny, J., "A Multi-Paradigm Simulation of the Effects of PHEV Adoption on Electric Utility Usage Levels and Emissions," *I&EC Puigjaner sp issue* (in press)

Nien-Hwa Linda Wang

Ph. D., Minnesota, 1978

Professor

Research Areas

Chemical and Biochemical Separations, Ion Exchange, Adsorption, Simulated Moving Bed Chromatography, Complex Adaptive Systems

Selected Professional Activities

Elected chair of Area 2E, Adsorption and Ion Exchange, Separations, AIChE

Elected second vice chair of the Separations Division, AIChE

Co-Chair of the Plenary on Fundamental and Applications of Adsorption and Ion Exchange I, AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Selected Invited Lectures

"Enabling Technologies for the Design of Batch and Simulated Moving Beds," Summer Institute, Center for Process Analytical Consortium, (CPAC), University of Washington, Seattle, WA, July (2010)

"Enabling Technologies for the Design of Simulated Moving Beds," AMPAC Fine Chemicals, Rancho Cordova, CA. July (2010)

"Standing Wave Design of Simulated Moving Beds for the Recovery of Sugars from Biomass Hydrolysate," N.-H.L. Wang, University Research In the Field of Biomass/ Renewables, AIChE Spring Meeting, Chicago, IL, March (2011)

"Simulated Moving Beds-Principles and Design Tools," N.-H. L. Wang, Symposium on Young Professional Tutorial: Separations, AIChE Spring Meeting, Chicago, IL, March (2011)

"Standing Wave Design of Simulated Moving Beds for High-Purity and High- Yield Multi-component Separations," N.-H.L. Wang, the Murphree Award Symposium on Recent Advances in Membranes and Separations, in Honor of Dr. Norman Li, 2011 ACS Spring Meeting, Anaheim, California, March (2011)

"Principles and Tools for Designing SMB for High-Purity and High-Yield Multi-component Separations," Rhodes Technologies, Coventry, RI, June (2011)

Selected Publications

Chen, S., Adijanto, L. and Wang, N.-H.L., "In Vitro Folding of Methionine-Arginine Human Lyspro ProinsulinS-sulfonate-Disulfide Formation Pathways and Factors Controlling Yield," *Biotechnology Progress*, **26(5)**, 1332-1343 (2010)

Chung, P.-L., Bugayong, J. G. and Chin, C.Y., "A Parallel pore and Surface Diffusion Model for Predicting the Adsorption and Elution Profiles of Lispro Insulin and Two Impurities in Gradient-Elution Reversed Phase Chromatography," *J. of Chromatography A*, **1217 (45)**, 7100-7108 (2010)

Tsui, H.-W., Kasat, R. B., Franses, E. I. and Wang, N.-H.L., "Mechanistic Studies of Chiral Discrimination in Polysaccharide Phases," *Advances in Chromatography*, **vol. 50** (in press).

Chin C. and Wang, N.-H. L., "Simulated Moving Bed Technology for Biorefinery Applications, Separation and Purification Technologies in Biorefineries," (in press).

Selected Conference Presentations

Chung, P., Chin, C. and Wang, N.-H.L., "Applications of Rate Model Simulations in the Design of Ion Exchange Process," AIChE Annual Meeting, Plenary on Fundamental and Applications of Adsorption and Ion Exchange, II, Salt Lake City, UT, November (2010)

Bugayong, J., Chung, P., Chin, C., Chen, S. and Wang, N.-H.L., "Model-Based Design of Reversed-Phase Chromatography for the Purification of Lispro Human Proinsulin Crude with Unknown Impurities," AIChE Annual Meeting, Symposium on Large Scale Chromatography, Salt Lake City, UT, November (2010)

Tsui, H.-W., Kasat, R. B., Franses, E.I. and Wang, N.-H. L., "IR Spectroscopy and Molecular Simulation Studies of Interactions of a Polymeric Sorbent with Chiral Enantiomers," AIChE Annual Meeting, Symposium on Characterization of Adsorbent Materials, Salt Lake City, UT, November (2010)

Ling, L., Gelis, A., Vandegrift, G. and Wang, N.-H.L., "Design and Optimization of Displacement Chromatography for Lanthanide Separations," Actinide Separations Conference, Charlotte, NC, May (2011)

Phillip C. Wankat

Ph. D., Princeton University, 1970

C. L. Lovell Distinguished Professor
Director, Undergraduate Degree Programs,
Department of Engineering Education

Research Areas

Adsorption Operations, Large-scale Chromatography, Distillation, Engineering Education

Selected Professional Activities

Associate Editor, Chemical Engineering Education, 1995-present.
International Editorial Advisory Board, Journal of STEM Education, 2001 – present.
Contributing Editor, College Teaching, 2006-present.
Director AIChE Education Division, 2009-2010
Editorial board, Separation Science and Technology 1977–present
Editorial Board, Adsorption, 1993–present
Editorial board, Separation and Purification Reviews, 1998–present
AIChE, Member Group 4, Education and Consulting of National Program Committee, 1977-present

Selected Invited Lectures

"Hybrid and Coupled Separation Systems," University of Canterbury, Christchurch, New Zealand, October (2010)

Selected Publications

Wankat, P. C., 'Separation Process Engineering. Includes Mass Transfer Analysis," *3rd edition, Prentice-Hall*, Upper Saddle River, NJ, (in press).

A Spanish translation, "Ingenieria de Procesos de Separacion," 3rd edicion, by Pearson Educacion de Mexico, (in press).

Lee, J. W. and Wankat, P. C., "Thermal Simulated Moving Bed Concentrator," *The Chemical Engineering Journal*, **166**, 511-522 (2011)

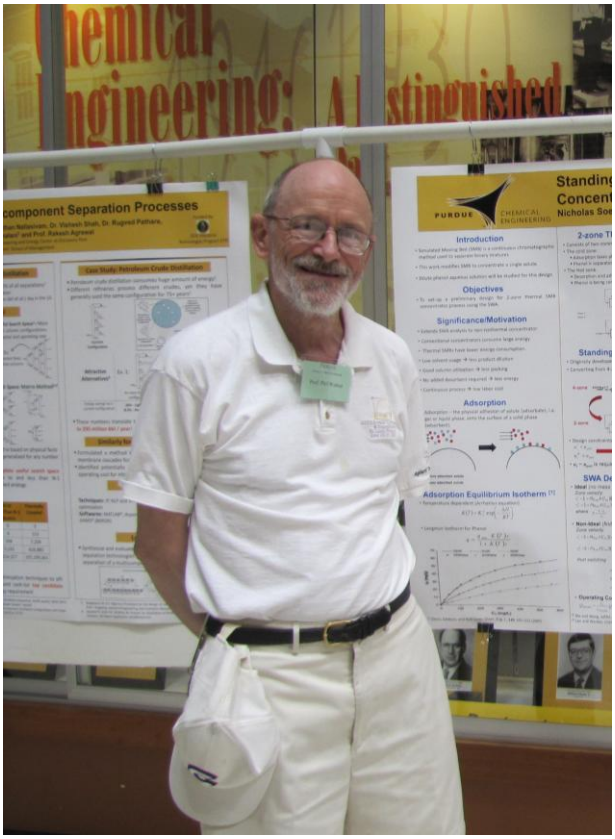
Sharma, P. and Wankat, P. C., "Solvent Recovery by Steam-less Temperature Swing Carbon Adsorption Processes," *Ind. Engr. Chem. Research*, **49**, 11602-11613 (2010)

Venkatesan, A. and Wankat, P. C., "Simulation of Ion Exchange Water Softening Pretreatment for Reverse Osmosis Desalination of Brackish Water," *Desalination*, **11**, 122-131 (2011)

Kostroski, K. and Wankat, P. C., "Hybrid Membrane-Cryogenic Distillations Air Separation Processes for Oxygen Production," *Separ. Sci Technol*., **46** /1539-1545 (2011)

Selected Conference Presentations

Wankat, P. C. and Kostroski, K., "Hybrid Membrane-Cryogenic Distillation Air Separation Processes for Oxygen Production," Procedings AIChE Annual Meeting, Salt Lake City, UT, November (2010)



You-Yeon Won

Ph. D., Minnesota, 2000

Associate Professor

Research Areas

Physics of polymers, polyelectrolytes, and block copolymers; polymer synthesis; polymer-based gene delivery; colloid self-assembly at liquid interfaces; scattering; microscopy; rheology

Selected Professional Activities

Organizer/Chair for a Focus Session, "Polymer Brushes", APS March Meeting in Dallas, TX, 2011

Vice-Chair for session titled "Polymerization Reaction Engineering, Kinetics, and Catalysis I", AIChE Annual Meeting in Salt Lake City, UT, 2010

Chair for session "Polymerization Reaction Engineering, Kinetics, and Catalysis II" AIChE Annual Meeting in Salt Lake City, UT, 2010

Selected Invited Lectures

"Block Copolymers for Tumor-Targeted Theragnostics" Organic Chemistry Division Seminar, Department of Chemistry, Purdue University, West Lafayette, IN, April (2011)

Selected Publications

Lee,H., Son, S. H., Sharma, R. and Won, Y.-Y., "A Discussion of the pH-Dependent Protonation Behaviors of Poly(2-(dimethylamino)ethyl methacrylate) (PDMAEMA) and Poly(ethylenimine-ran-2-ethyl-2-oxazoline) (P(EI-r-EOz))," *Journal of Physical Chemistry B*, **115(5)**, 844-860 (2011)

Kestur, U. S., Lee, H., Santiago, D., Rinaldi, C., Won, Y.-Y. and Taylor, L. S., "Effects of the Molecular Weight and Concentration of Polymer Additives, and Temperature on the Melt Crystallization Kinetics of a Small Drug Molecule," *Crystal Growth & Design*, **10(8)**, 3585-3595, (2010)

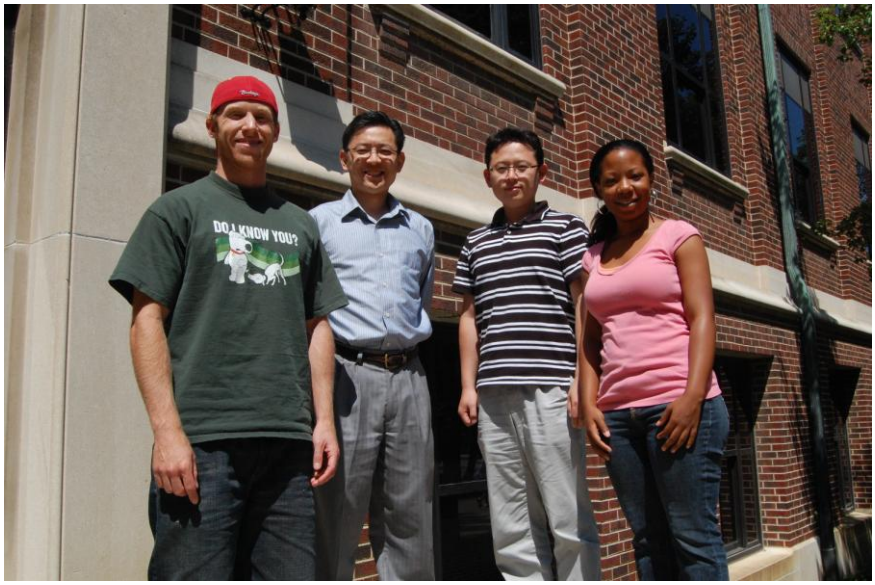
Gary, D. J., Lee, H., Sharma, R., Lee, J.-S., Kim, Y., Cui, Z. Y., Jia, D., Bowman, V. D., Chipman, P. R., Wan, L., Zou, Y., Mao, G., Park, K., Herbert, B.-S., Konieczny, S.F. and Won, Y.-Y., "Influence of Nano-Carrier Architecture on In Vitro siRNA Delivery Performance and In Vivo Biodistribution: Polyplexes vs. Micelleplexes," *ACS Nano*, **5(5)**, 3493-3505, (2011)

Selected Conference Presentations

Park, H. W., Ohn, K. and Won, Y.-Y., "Formation and Collapse of Biodegradable Polymer Monolayers at the Air-Water Interface," APS March Meeting, Dallas, TX, March (2011)

Kim, D. H., Caruthers, J. M., Pipes, R. B. and Won, Y.-Y., "In Situ-Polymerized CNT/Polyimide Nanocomposites: Effect of Reaction Stoichiometry on the Glass Transition Properties of the Nanocomposites," AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Lee, H., Son, S. H., Sharma, R. and Won, Y.-Y., "Molecular Origin of the Proton Buffering Properties of Polymeric Amines," AIChE Annual Meeting, Salt Lake City, UT, November (2010)



Yue Wu

Ph. D., Harvard, 2006

Assistant Professor

Air Force Summer Faculty Fellowship, 2010
DuPont Young Professor Award, 2010

Research Areas

Synthesis, Characterization, Assembly of Nanostructured Materials and Their Potential Applications in Nanoscale Devices and Sustainable Energy

Selected Professional Activities

Reviewer for Nano Letters, Journal of American Chemical Society, Journal of Physical Chemistry C, Environmental Science and Technology, IEEE Electronic Device Letters, Chemistry of Materials, Nanoscale Nano Research, ACS Petrolum Research Fund, National Science Foundation

Selected Invited Lectures

Department of Chemical Engineering, Tsinghua University, Beijing, P. R. China, December (2010)

Department of Chemistry, Tsinghua University, Beijing, P. R. China, December (2010)

National Center for Nanoscience and Technology (NCNST), Beijing, P. R. China, December (2010)

Department of Electronics, Peking University, Beijing, P. R. China, December (2010)

Selected Publications

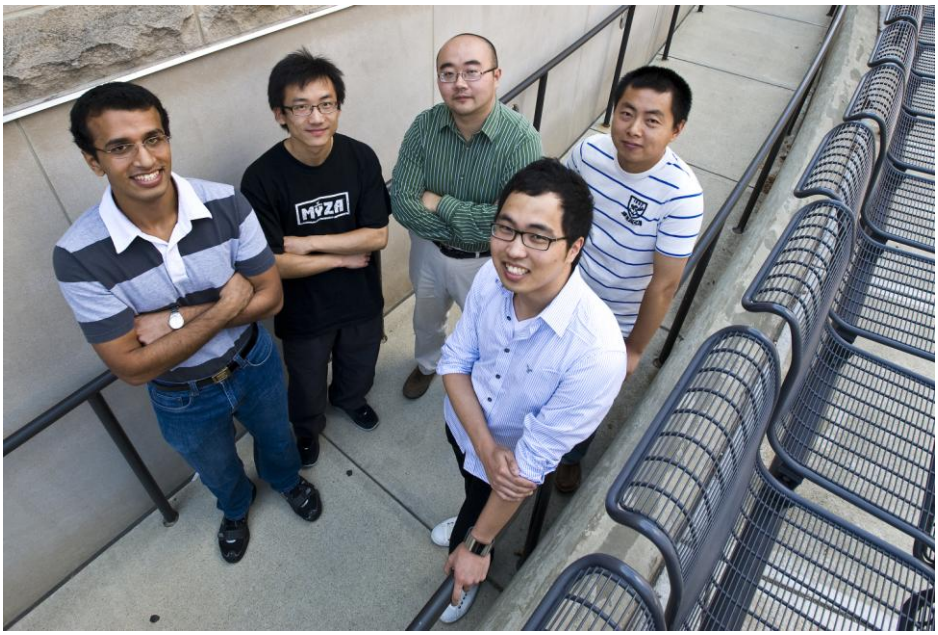
Zhang, G., Finefrock, S., Liang, D., Yadav, G. G., Yang, H., Wu, Y., "Semiconductor Nanostructure-based Photovoltaic Solar Cells," **Invited Review**, *Nanoscale* (in press)

Yadav, G. G., Susoreny, J. A., Zhang, G., Yang, H., Wu, Y.*, "Evaluating the Applicability of Thermoelectric Materials as a Viable Technological Alternative for Power Generation", Invited Perspective Feature Article, Energy & Environmental Science (in press).

Selected Conference Presentations

Wu, Y., "Molecular Scale Chalcogenide Nanowires for Thermoelectric Conversion," AIChE Annual Meeting, Salt Lake City, UT, November (2010)

Wu, Y., "Performance Enhancement of Hybrid Solar Cells through Chemical Vapor Annealing," AIChE Annual Meeting, Salt Lake City, UT, November (2010)



Chongli Yuan

Ph. D., Cornell, 2007

Assistant Professor

Research Areas

Biomimetic Nanoparticle Systems, Molecular Biophysics

Selected Professional Activities

AIChE 2011, Nanoscale Science Session Co-Chair

Peer reviewer of Journal of American Chemical Society, Nucleic Acids Research

Panelist: National Science Foundation, Biomedical Engineering, January, 2011; May, 2010

Selected Publications

Ding, S., Zhu, T., Chen, J.S., Wang, Z., Yuan, C. and Lou, X.W., "Controlled synthesis of hierarchical NiO nanosheet hollow spheres with enhanced supercapacitive performance," *J. Material Chemistry* (in press).

Graduate Degrees Awarded

(July 1, 2010 to June 30, 2011)

M.S.	**14**
Ph.D.	**17**
Total	**31**

Ph. D. Degrees - August 2010

Chaugule, Saurabh S.
NO_x Storage and Regeneration on Pt/BaO/γ-Al_2O_3 Lean NO_x (Ribeiro/Delgass), Research Engineer, Shell Oil, Houston, TX

Fingland, Bradley R.
Novel Approaches to Catalyst Characterization in Planar and Porous Systems, (Ribeiro/Delgass), Advanced Researcher, ExxonMobil, Clinton, NJ

Gary, Dana J.
A-B-C Triblock Copolymer Micelles for Intracellular Delivery of Cancer-Targeted siRNA, (Won), R&D Engineer, ExxonMobil, Paulsboro, NJ

Hodge, Bri-Mathias
A Multi-Paradigm Modeling Approach for Energy Systems Analysis, (Pekny/Reklaitis), Postdoc, NREL, Golden, CO

Kar, Mahaprasad
Formation Pathway of $CulmSe_2$ Nanocrystals and Solution Deposition of $CulnSe_2$ Films for Photovoltaic Applications, (Agrawal/Hillhouse), Associate Engineer, ConocoPhillips, Bartlesville, OK

Lim, Jung-Sun
Prepartation of Uniform Sized Metal-Organic Nanocomposites Using Tobacco Mosaic Virus, (Harris), Research Scientist, Hiroshi Matsui-Hunter College, New York, NY

Pathare, Rugved P.
Design and Optimization of Binary Membrane-Based Separations, (Agrawal), Senior Engineer, Dow Chemical Company, Midland, MI

Ramalingam, Santhosh K.
Fluid Mechanics of Coupled Interfacial Systems, (Basaran), Senior Engineer, Dow Chemical Company, Freeport, TX

Sharma, Pradeep K.
Adsorption Based Novel Purification Processes, (Wankat), Senior Engineer, Algenol Biofuels, Fort Myers, FL

M.S. Degrees - August 2010

AL-Musleh, Easa
Efficient Liquefaction Cycles for Natural Gas, (Agrawal/Reklaitis), Continuing on for PhD, Purdue University, West Lafayette, IN

Luque, Maria Elisa
Towards the Development of an Ontological Framework for Drug-Loaded Film Manufacture, (Reklaitis/Pinal), Oil Loss/Off Site Technical Coordinator, Esso Petroleva Argentina S.R.L., Compana-Provincia de Guenos Aires

Venkatesan, Anand
Ion Exchange Pretreatment for Reverse Osmosis Desalination of Brackish Water, (Wankat), Continuing for PhD, Purdue University, West Lafayette, IN

Zarate, Nyah
The Influence of Interfacial Condensed Moisture on Adhesion Between Solid Organic Particles and Surfaces, (Litster), Continuing for PhD, Purdue University, West Lafayette, IN

Li, Jianfeng
(Litster), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

Ph.D. Degrees – December 2010

Chen, Shuang
In Vitro Folding of Methionine-Arginine Human Lyspro-Proinsulin: Pathways and Kinetics, (Wang), Senior Scientist, Pfizer, Inc., Chesterfield, MO

Hamdan, Intan M.
Exceptional Events Management Applied to Pharmaceutical Manufacturing, (Venkatasubramanian/Reklaitis), Senior Engineer, Dow Chemical Company, Freeport, TX

Shah, Vishesh H.
Energy Savings in Distillation Via Identification of Useful Configurations, (Agrawal), Senior Engineer, Dow Chemical Company, Midland, MI

Shukla, Aviral
Evaluation Trade-Offs for Profitable Design of Network Infastructure Using Multi-Criteria Optimization, (Venkatasubramanian), Sr. Process Engineer, Intel Corporation, Chandler, AZ

M.S. Degrees - December 2010

Bates, Shane A.
A Study to Determine the Active Site in the Oxidative Dehydrogenation of Ethanol Over Mixed Fe2(Mo04)3-Mo03 Catalysts, (Baertsch), Continuing on for PhD, Purdue University, West Lafayette, IN

Kadrmas, Clancy R.R.
Block Copolymer Toughened Polyimides and Quantitative Evaluation of Epoxy Cure Kinetic Models, (Won/Caruthers), Continuing on for PhD, Purdue University, West Lafayette, IN

Chen, Ye
(Reklaitis/Pekny), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

Huang, Shisheng
(Agrawal/Reklaitis/Pekny), MS Non-Thesis, Purdue Univeristy, West Lafayette, IN, Continuing on for PhD

Shenvi, Anirudh Arun
(Reklaitis), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

Zhang, Rong
(Baertsch), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

Ph.D. May 2011

Ford, Grayson M.
Solar Cells from Multinary Nanocrystal Links,
(Agrawal/Hillhouse), Postdoc, Purdue University, West Lafayette, IN

Hu, Wenbin
Catalytic Oxidation of Glycerol to High-Value Chemical Dihydroxyacetone Over Pt-Bi/C Catalyst, (Varma), CDP Research Engineer, Air Products, Inc., Allentown, PA

Stamatis, Stephen D.
Bayesian Microkinetic Modeling of Epoxy Resin Curing and Water Gas Shift Catalysis, (Caruthers/Delgass), Postdoc, University of Iowa, Iowa City, IA

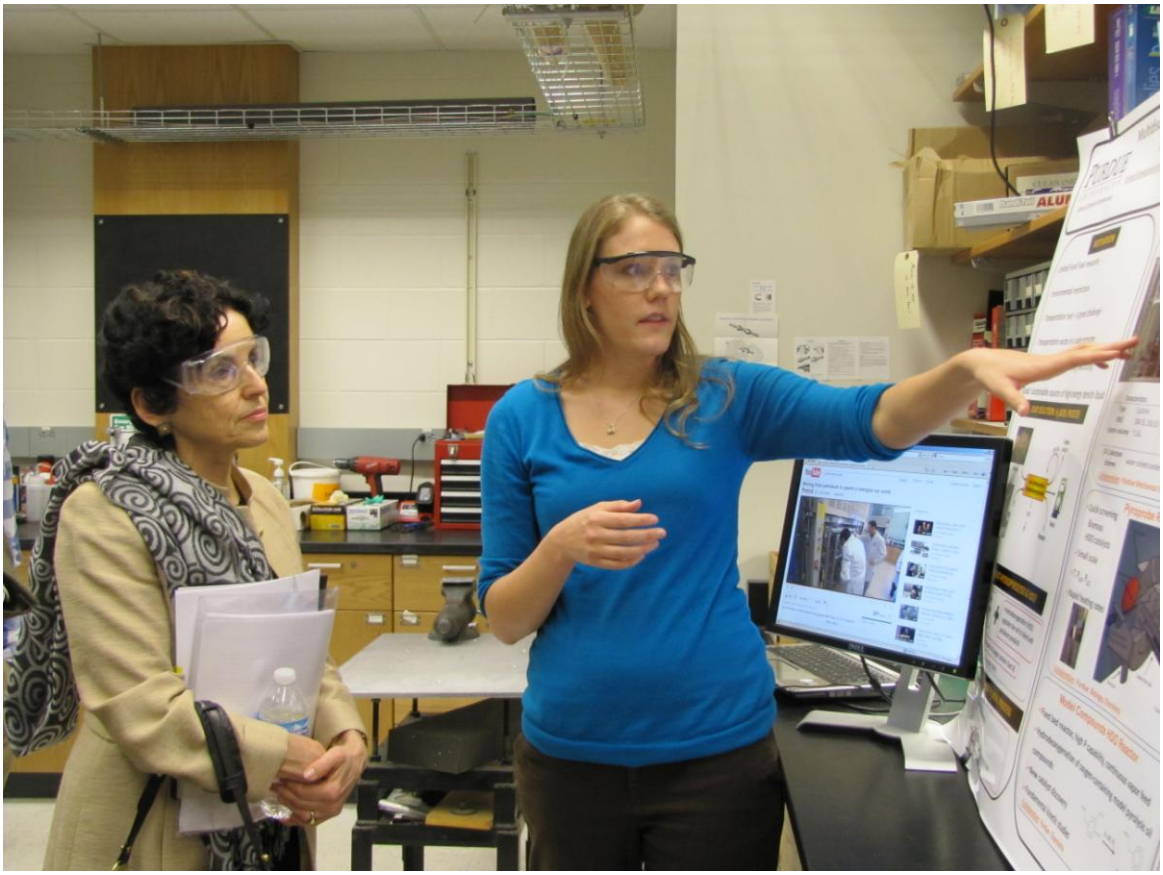
Zhang, Rong
Catalyst and Microsystem Investigations for the Selective Detection of CO in Concentrated H_2 Fuels Using Mixed Copper Cerium Oxide Catalysts, (Baertsch), Tamp, FL

M.S. Degrees – May 2011

Al-Kukhun, Ahmad Y.
(Varma), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

Gao, Haojing
(Basaran/Harris), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD

Lee, Wensheng
(Caruthers), MS Non-Thesis, Purdue University, West Lafayette, IN, Continuing on for PhD



Graduate Student Enrollment - Fall 2010

	Last Name	First Name	Advisor(s)	UG/M.S. Degree	Date Enrolled
1	Abbou Oucherif	Kaoutar	Litster	New Mexico Institute of Mining	Spring 2010
2	Al-Kukhun	Ahmad	Varma	Jordan University of Science & Tech	Fall 2008
3	Al-Musleh	Easa	Agrawal/Reklaitis	Quatar University	Fall 2008
4	Appathurai	Santosh	Basaran/Harris	Indian Institute of Tech, Madras	Fall 2007
5	Austin	John	Harris	Worcester Polytechnic Institute	Fall 2010
6	Balachandran	Dave	Beaudoin	University of Wisconsin	Fall 2006
7	Bates	Shane	Baertsch	Pennsylvania State University	Fall 2008
8	Brennan	Mary Jane	Liu	Purdue University	Fall 2010
9	Brew	Kevin	Agrawal	University of Delaware	Fall 2010
10	Carter	Nathan	Agrawal	Missouri University of Science & Tech	Fall 2010
11	Chen	Shuang	Wang	Zhejiang University	Fall 2005
12	Chen	Si	Pipes	Cornell University	Fall 2010
13	Chen	Ye	Reklaitis/Pekny	Zhejiang University	Fall 2007
14	Choudhari	Harshavardhan	Agrawal/Delgass/ Ribeiro	University Institute of Chemical Tech	Fall 2009
15	Cipich (Chaffee)	Michelle	Beaudoin	Tri-State University	Fall 2006
16	Cook	Melissa	Beaudoin	Mississippi State University	Fall 2010
17	David	Anand	Caruthers/Pekny	U. of Minnesota, Twin Cities/Iowa St U.	Fall 2009
18	Detwiler	Michael	Ribeiro/Delgass	Youngstown State University	Fall 2010
19	Devaraj	Jayachandran	Ramkrishna	Natl U. of Singapore/Univ. of Madras	Fall 2009
20	Dietrich	Paul	Ribeiro/Baertsch/ Delgass	University of Wisconsin/Madison	Fall 2009
21	Dong	Jiannan	Franses/Corti	Zhejiang University	Fall 2008
22	Easton	Mckay	Thomson	Brigham Young Universit	Fall 2010
23	Emady	Heather	Litster/Wassgren	University of Arizona, Tuscon	Fall 2007
24	Fang	Haiyu	Wu	University of Science & Tech	Fall 2010
25	Finefrock	Scott	Wu	Case Western Reserve University	Fall 2010
26	Ford	Grayson	Agrawal/Hillhouse	University of California, Santa Barbara	Fall 2006
27	Freer	Alexander	Harris	University of Notre Dame	Fall 2010
28	Gaik	Steven	Agrawal/Hillhouse	Pennsylvania State University	Fall 2007
29	Galas	Richard	Liu	SUNY - Buffalo	Fall 2008
30	Gao	Danni	Varma	Tsinghua University	Fall 2009
31	Gao	Haijing	Basaran/Harris	Tsinghua University	Fall 2006
32	Gawecki	Piotr	Agrawal/Delgass/ Ribeiro	University of California, Riverside	Fall 2008
33	Gharachorlou	Amir	Ribeiro	Amir Kabir University of Tech	Spring 2010
34	Ghose	Ranjita	Varma	Univ. Inst. of Chem. Tech/U. of Florida	Fall 2009
35	Gupta	Anshu	Reklaitis/ Venkatasubramanin	Indian Institute of Technology, Madras	Fall 2010
36	Hages	Charles	Agrawal	University of California, Santa Barbara	Fall 2010

	Last Name	First Name	Advisor(s)	UG/M.S. Degree	Date Enrolled
37	Hamdan	Intan	Reklaitis/ Venkatasubramanin	Purdue University	Fall 2006
38	Hill	Cameron	Morgan	Montana State University	Fall 2009
39	Hirshfield	Laura	Reklaitis/ Venkatasubramanin	University of Michigan/Ann Arbor	Fall 2009
40	Hoeferkamp	Katherine	Yuan	North Carolina State University	Fall 2010
41	Honda	Gregory	Varma	University of Connecticut	Fall 2010
42	Hsu	Hsin-yun	Harris	National Tsing Hua University	Fall 2010
43	Hu	Wenbin	Varma	Tsinghua University	Fall 2006
44	Huang	Shisheng	Agrawal/Pekny/ Reklaitis	National University of Singapore	Fall 2007
45	Huff	Joshua	Agrawal	Texas A & M University	Spring 2010
46	Jimenez-useche	Isabel	Yuan	University De Los Andes	Fall 2009
47	Kadrmas	Clancy	Caruthers/Won	University of North Dakota	Fall 2007
48	Kelkar	Aniruddha	Franses/Corti	Institute of Chemical Technology	Fall 2010
49	Kim	Dae Hwan	Won	Seoul National University	Fall 2007
50	Kim	Jaewoo	Caruthers	Seoul National University	Fall 2008
51	Kim	Yeji	Liu	Korea University	Fall 2009
52	Kispersky	Vincent	Delgass/Ribeiro	University of California, Santa Barbara	Fall 2007
53	Koswara	Andy	Chakrabarti	University of California, San Diego	Fall 2009
54	Lee	Eunwoong	Caruthers	Seoul National University	Fall 2006
55	Lee	Hoyoung	Won	Korea University	Spring 2009
56	Lee	Wen-Sheng	Delgass/Ribeiro	National Taiwan University	Fall 2007
57	Li	Jianfeng	Litster/Wassgren	Tsinghua University	Fall 2007
58	Ling	Lei	Wang	Tsinghua University	Fall 2009
59	Louvier	Matthew	Venkatasubramanian/Reklaitis	University of Calfifornia, Los Angeles	Fall 2010
60	Mallapragada	Dharik	Agrawal/Delgass/ Ribeiro	Indian Institute of Technology, Madras	Fall 2008
61	Marimuthu	Kartikeyan	Chakrabarti	Anna University/IIT-Madras	Fall 2009
62	McCarthy	Robert	Agrawal/Hillhouse	Washington University	Fall 2007
63	Mc Gough	Patrick	Basaran	Purdue University/Purdue University	Spring 2007
64	Mehta	Dhairya	Agrawal/Ribeiro/ Delgass	University Institute of Chemical Tech	Fall 2009
65	Misiego Arpa	C. Rocio	Pipes	U of Valladolid/Purdue University	Fall 2010
66	O'Grady	John	Morgan	Rose-Hulman Institute of Technology	Fall 2008
67	O'Regan	Peter	Caruthers	Tufts University	Fall 2010
68	Ogebule	Oluwaseyi	Caruthers	Alabama Agricultural & ME U	Fall 2008
69	Oglesby	Patrick	Harris	Purdue University	Fall 2005
70	Parekh	Atish	Ribeiro/Delgass	Indian Institute of Technology, Bombay	Fall 2010
71	Park	Hye Yeon	Agrawal/Hillhouse	Korea University	Fall 2009
72	Pazmino	Jorge	Delgass/Ribeiro	U. San Fran De Quito, Ecudor	Fall 2006
73	Pommer	Chris	Basaran/Harris	Purdue University	Fall 2007
74	Prabhu	Rasika	Caruthers	University of Bombay	Fall 2007

	Last Name	First Name	Advisor(s)	UG/M.S. Degree	Date Enrolled
75	Renner	Julie	Liu	University of North Dakota	Fall 2007
76	Ridder	Bradley	Chakrabarti	University of South Florida	Fall 2010
77	Sabnis	Kaiwalya	Ribeiro/Delgass	Institute of Chemical Technology	Fall 2010
78	Sambath	Krishnaraj	Basaran	Indian Institute of Technology, Madras	Fall 2008
79	Sengupta	Neelanjan	Morgan	Indian Institute of Technology, Bombay	Fall 2006
80	Shah	Vishesh	Agrawal/Reklaitis	UICT - Mumbai	Fall 2006
81	Shekhar	Mayank	Delgass/Caruthers/Ribeiro/ Thomson	UICT - Mumbai	Fall 2008
82	Shenvi	Anirudh	Agrawal/Reklaitis/ Venkatasubramanian	UICT - Mumbai	Fall 2007
83	Sheets	Erik	Agrawal	Villanova University	Fall 2010
84	Shu	Che-Chi	Ramkrishna	National Taiwan University	Fall 2007
85	Shukla	Aviral	Venkatasubramanian/Morris	Indian Institute of Technology, Madras	Fall 2006
86	Singh	Meenesh	Ramkrishna	Sardel Patel University	Spring 2008
87	Smith	Kathryn	Beaudoin	University of Wisconsin	Fall 2008
88	Soepriatna	Nicholas	Wankat	University of Texas,Austin	Spring 2010
89	Sollberger	Fred	Ribeiro/Delgass	University of Illinois, Urbana-Champaign	Fall 2010
90	Son	Sang Ha	Caruthers	Yonsei University	Fall 2007
91	Stamatis	Stephen	Caruthers/Delgass	University of Michigan	Fall 2005
92	Su	Sheng-chuan	Liu	National Taiwan University	Fall 2009
93	Suchomel	Mark	Caruthers/Pekny	University of Minnesota,Duluth	Fall 2009
94	Sung	Pei-Fang	Harris	National Taiwan University	Fall 2006
95	Switzer	Jeffrey	Caruthers/Thomson	University of California, Davis	Fall 2006
96	Thomas	Myles	Beaudoin	Utah State University	Fall 2010
97	Torabi	Korosh	Corti	Isfan University/IIT-Chicago	Fall 2007
98	Tsui	Hung-Wei	Franses/Wang	National Taiwan University	Fall 2009
99	Venkatakrishnan	Vinod	Agrawal/Delgass Ribeiro	Indian Institute of Technology, Madras	Fall 2009
100	Venkatesan	Anand	Wankat	Indian Institute of Technology, Madras	Fall 2008
101	Verma	Anuj	Ribeiro/Delgass	Institute of Chemical Technology	Fall 2010
102	Vora	Shaunak	Litster	UICT - Mumbai	Fall 2007
103	Walker	Bryce	Hillhouse/Agrawal	Brigham Young Universit	Fall 2009
104	Williams	W. Damion	Delgass/Ribeiro	University of Oklahoma	Fall 2006
105	Xiong	Silei	Caruthers/Delgass/Thomson	Tsinghua University	Fall 2009
106	Yadav	Gautam	Wu	University of Western Ontario	Fall 2009
107	Yang	Haoran	Wu	Tsinghua University	Spring 2010
108	Yohe	Sara	Agrawal/Delgass/ Ribeiro	University of Minnesota,Twin Cities	Fall 2008
109	Zarate	Nyah	Beaudoin/Litster	Illinois Institute of Technology, Chicago	Fall 2008
110	Zhang	Rong	Baertsch	Jilin University/Miami University	Fall 2007
111	Zhu	Qing	Harris/Taylor	Zhejiang University	Fall 2006

Facilities

Forney Hall of Chemical Engineering

In October 2004, the School of Chemical Engineering dedicated a 100,000 ft^2 expansion that more than doubled the size of our building. The building was then re-named the Forney Hall of Chemical Engineering. With new lecture facilities and new bioengineering, catalysis, and nanoscience research laboratories, the School has, for the first time in decades, space to grow. The original building is currently undergoing modernization, particularly in the laboratory and associated spaces. Renovation is scheduled to be completed in early 2012.

Discovery Park

Since 2002, Discovery Park - made up of 10 centers - has grown from an idea to a $450 million interdisciplinary research, learning and engagement complex. More than 1,000 faculty have been involved in Discovery Park. Nearly 3,000 students have participated in Discovery Park programs, and 250 graduate students have offices there. Our faculty are involved in cutting edge research in the Bindley Bioscience, Birck Nanotechnology, Energy, and Oncological Sciences Centers.

Bindley Bioscience Center

The Bindley Bioscience Center initiates and facilitates multi-investigator, multidisciplinary research that blends life sciences and engineering. State-of-the-art research programs focus along strategic lines that advance proteomic science and technology, bionanotechnology and biomicrotechnology, spectroscopy-microscopy for cellular and tissue imaging, tissue engineering, and bio-informatics.

Birck Nanotechnology Center

The Birck Nanotechnology Center is a leading-edge national center for nanoscale research. The BNC leverages advances in nano-scale science and engineering to create innovative nanotechnologies that address challenges in computing, communications, the environment, security, energy independence and health. The Center is located in a $54 million state-of-the-art building that houses specialized laboratories for nano-scale chemistry, physics, and biology; semiconductor-grade cleanrooms; and office space.

Energy Center

The Energy Center is a multidisciplinary community of researchers, scientists, engineers, political scientists and economists. Their goal is create the energy solutions needed by Indiana, the Nation, and the World. Energy research areas include clean coal, solar, bio, wind, electrochemical, electric machines and power electronics, hydrogen and nuclear. Global partnerships and the social, economic and political aspects of energy use and policy are also being advanced. Research on the conversion of agricultural waste into transportation fuels is conducted in the Laboratory for Renewable Resource Engineering (LORRE) in the Energy Center.

Oncology Center

The Oncological Sciences Center's mission is to eliminate cancer as a cause of suffering and death by applying and synergizing Purdue's strengths in the biological, chemical, engineering and human behavioral sciences. The Oncological Sciences Center builds and expands on the strong foundation of Purdue's NCI-designated Cancer Center. The Center has established strategic research partnerships with the Walther Cancer Institute and the Indiana University Simon Cancer in Indianapolis. The relationship with the Indiana University Simon Cancer Center provides the clinical setting necessary to advance and refine early-stage detection and treatment of cancers.

Visiting Faculty

Dr. Luis Puigjaner
UPC - ETSEIB
Dpt. Enginyeria Química, Barcelona, Spain

Dr. Enrico Martinez
Profesor, Instituto de Estudios Superiores de Tamaulipas Altamira, Mexic

Academic Advisory Board

Formed in 2006 to provide input on academic issues, the Academic Advisory Board had its meeting on April 11-13, 2011. Current Board members are:

- **Kristi Anseth**, Distinguished Professor, University of Colorado, Boulder;
- **Alexis T. Bell**, Dow Professor of Sustainable Chemistry, UC-Berkeley;
- **Ignacio Grossman**, Rudolph R. and Florence Dean University Professor of Chemical Engineering, Carnegie-Mellon University;
- **Michael Ramage**, Executive Vice President, ExxonMobil (Retired);
- **Gregory Stephanopoulos**, Bayer Professor of Chemical Engineering, MIT;
- **Frank Bates**, Regents Professor and Head, Chemical Engineering and Materials Science, University of Minnesota.

Industrial Advisory Council

The Chemical Engineering Industrial Advisory Council (IAC) was initiated in 1988 through the leadership support of senior executives from Abbott Laboratories, Air Products and Chemicals, Amoco, Dow Chemical and Quantum Chemical. Today the ChE IAC remains a partnership of leading corporations with the School of Chemical Engineering to advance and improve the education and professional preparation of chemical engineers who will meet the needs of industry in the 21st century.

The current IAC members are listed below.

3M
Abbott
Air Liquide
Air Products and Chemicals Inc.
Anheuser-Busch, Inc.
BP
ChevronPhillips Chemical
Dow Chemical Company
Du Pont
Eastman Chemical Company
Elanco Animal Health, a division of Eli Lilly
ExxonMobil Chemical Co.
Honeywell Process Solutions
Lubrizol Corporation
LyondellBasell
National Starch & Chemical Corp.
Pfizer Global
Procter & Gamble Co.
Roquette America Inc.
Shell Global Solutions (US) Inc.
UOP LLC

These corporations provide financial support for curriculum innovations, scholarships, experimental facilities enhancements, instructional computing facilities and start-up support for young faculty. The Fall 2010 meeting took place on October 14 in Forney Hall, Purdue; the Spring 2011 meeting occurred February 11, 2011 in Naples, Florida.

Seminar Speakers - Fall 2010

September 7, 2010
Dr. Linda J. Broadbelt
Sarah Rebecca Roland Professor & Chair of the
Department of Chemical Engineering
Northwestern University
"Designing Reaction Pathways to Novel Chemicals and Materials Using Kinetic Modeling"

September 14, 2010
Dr. Ramon Gonzalez
Associate Professor
Rice University
"Understanding and harnessing microbial metabolism: the role of systems biology and metabolic engineering"

October 5, 2010
Dr. Mary Kraft
Assistant Professor
University of Illinois-Urbana Champaign
"Chemical imaging of lipid organization in model and cellular membranes"

October 7, 2010
Dr. Michael P. Ramage
Executive Vice President (retired)
Exxon Mobil Research and Engineering Company
"Transitions To Alternative Transportation Technologies: A Focus on Plug-In Hybrid Electric Vehicles"

October 19, 2010
Dr. Christodoulos A. Floudas
Stephen C. Macaleer '63 Eng. & Applied Science,
Professor of Chemical Engineering
Princeton University
"De Novo Design of Proteins and Protein-Peptide Complexes"

November 23, 2010
Dr. John Morgan
Associate Professor
School of Chemical Engineering
Purdue University
"Determination of Metabolic Fluxes in Green Organisms"

November 30, 2010
Dr. Jeffrey Reimer
Chair, Chemical Engineering
University of California - Berkeley
"Spin Control for Chemical Engineers"

December 7, 2010
Dr. Denis Wirtz
Theophilus H. Smoot Professor
Johns Hopkins University
"Cell motility in 3D"

Seminar Speakers – Spring 2011

January 18, 2011
Dr. Joseph S. Francisco
William E. Moore Distinguished Professor of Earth & Atmospheric Sciences & Chemistry
Purdue University
"Structure and Reactivity of Radical-Molecule Complexes: New Frontier in Atmospheric Chemistry"

January 25, 2011
Centennial Seminar
Dr. Robert Hannemann (BS 1952)
Professor of Biomedical/Chemical Engineering/ Psychological Sciences
Purdue University
"Purdue Chemical Engineering and Medical Research – A Review of the Past and a Vision of the Future"

February 17, 2011
Centennial Seminar
Dr. Surya K. Mallapragada (PhD 1996)
Stanley Professor of Interdisciplinary Engineering
Chair, Dept. of Chemical & Biological Engineering
Iowa State University
"Bioinspired Materials"

February 22, 2011
Dr. Robert R. Peoples
Director, Green Chemistry Institute (GCI)
American Chemical Society
"Path to a Sustainable Future – Role of Green Chemistry and Engineering"

March 22, 2011
Centennial Seminar
Dr. Aditya Bhan (PhD 2005)
Assistant Professor
Department of Chemical Engineering & Materials Science
University of Minnesota
"Catalysis in a Pocket: Catalytic Consequences of Spatial Constraints in Acidic Zeolites"

March 31, 2011
Faculty Lecture Award
Dr. Vishesh H. Shah (PhD 2010)
Senior Engineer, Dow Chemical Company
"Energy Savings in Distillation via Identification of Useful Configurations"

Kelly Lectures
Dr. Stanley I. Sandler
H.B. DuPont Chair of Chemical Engineering,
Professor of Chemistry & Biochemistry
University of Delaware

April 5, 2011
"Destroying Weapons of Mass Destruction"

April 6, 2011
"Quantum Mechanics: An Underutilized Tool in Thermodynamics"

April 14, 2011
Centennial Seminar
Mr. Michael J. Graff (MS 1979)
President/CEO
American Air Liquide Holdings, Inc.
Air Liquide
"Science & Engineering: Serving in the 21st Century"

April 21, 2011
Centennial Seminar
Mr. Charles D. Davidson (BS 1972)
Chairman/CEO
Noble Energy, Inc.
"Technology Impacts on Global Energy Supplies"

April 26, 2011
Dr. Roger A. Schmitz
Keating-Crawford Professor Emeritus
Dept. of Chemical & Biomolecular Engineering
University of Notre Dame
"A Venture into Ecosystem Dynamics: Models and Complexities"

April 28, 2011
Centennial Seminar
Mr. Michael H. Ott (BS 1974)
President/CEO
Polysciences Incorporated

May 3, 2011
Dr. Sampson A. Jenekhe
Boeing-Martin Professor of Chemical Engineering and Professor of Chemistry
University of Washington