

Pradeep K. Agrawal

Professor and Associate Chair for Undergraduate program
Frank Dennis Senior Faculty Fellow
School of Chemical & Biomolecular Engineering
Georgia Institute of Technology
Atlanta, Georgia 30332

Pradeep.Agrawal@ChBE.gatech.edu

(404) 894-2826 (O)

(404) 894-2866 (fax)

I. EDUCATION

University of Delaware	Chemical Engineering	PhD	1979
University of Delaware	Chemical Engineering	MChE	1977
University of Roorkee (IIT, Roorkee)	Chemical Engineering	BChE	1974

II. EMPLOYMENT

Georgia Institute of Technology, School of Chemical & Biomolecular Engineering

2010-present Professor
2006-present Associate Chair for Undergraduate Studies
2013-present Frank Dennis Senior faculty Fellow
2011-2013 Shell Faculty Fellow
2008 -2010 ConocoPhillips Faculty Fellow
2005-2008 Lee & Dorothy Tanner Faculty Fellow
1985-2010 Associate Professor
1979-1985 Assistant Professor

E.I. du Pont de Nemours, Inc., Jackson Research Laboratory, New Jersey

Summer 1984 Visiting Professor

University of Delaware, Newark, Delaware

Summer 1979 Post-doctoral Fellow

III. HONORS AND AWARDS

- 2016 Top Ten Most Influential Persons in the Georgia Tech Alumni Survey
- 2009 Outstanding Undergraduate Advisor, Institute-wide award
- 2009 Teaching Excellence Award, Women in Engineering (Institute-wide award)
- 1994 Outstanding AIChE Student Chapter Advisor Award
- 1996 W. Roanne Beard Outstanding Teacher Institute-wide award
- 1995 Outstanding Professor in the College of Engineering, Order of Omega
- 2007 W. T. Ziegler Award- Best Professor of the Year
- 2006 W. T. Ziegler Award- Best Professor of the Year
- 2005 W. T. Ziegler Award- Best Professor of the Year
- 2000 W. T. Ziegler Award- Best Professor of the Year
- 1995 Omega Chi Epsilon – Outstanding Faculty Award
- 1994 W. T. Ziegler Award- Best Professor of the Year
- 1994 Initiated into the Tau Beta Pi Honor Society as “Eminent Member”
- 1992 Omega Chi Epsilon – Outstanding Faculty Award
- 1990 Sigma Xi Award – Best PhD Thesis (co-advisor)
- 1990 W. T. Ziegler Award- Best Professor of the Year
- 1989 W. T. Ziegler Award- Best Professor of the Year
- 1988 Omega Chi Epsilon – Outstanding Faculty Award
- 1986 W. T. Ziegler Award- Best Professor of the Year
- 1983 Omega Chi Epsilon – Outstanding Faculty Award
- 1982 W. T. Ziegler Award- Best Professor of the Year
- 1980 Rookie Professor of the Year Award
- 1974 Ranked first in a class of 36 students BChE 1974
- 1974 Recipient of Three Silver Medals

IV. TEACHING

During the past 37 years at Georgia Tech, eight different undergraduate level courses (Kinetics and Reactor Design, Process Control, Plant Design, Synthetic Fuels, Chemical Process Principles, Heat Transfer, Transport Phenomena II, and Unit Operations Laboratories) and four different graduate level courses (Advanced Reactor Design, Heterogeneous Catalysis, Biochemical Engineering I & II) have been taught.

The Synthetic Fuels course was co-developed for the first time in 1982. We did not have a laboratory for the Process Dynamics and Control course, which was developed, set-up and integrated with the course-work during 1980-82.

A major revamp of our undergraduate Transport Phenomena/ Unit Operations Laboratory course sequence was undertaken when I took over the laboratory in 1993. One of the biggest challenges was to help the students develop their communication skills. We added a new staff position in 1994 as communications specialist who would work closely with the undergraduate students and developed a set of guidelines where

three aspects of good communication skills were identified: (1) critical thinking, (2) material organization, and (3) elements of style. The concept of critical thinking is sorely lacking in the contemporary education of technical communication. The writing program specialist is trained in the later two aspects, but has little training in critical thinking. Hence, the challenge to teach critical thinking was addressed by asking a set of questions for each part of the report. It was equally important to recognize that critical thinking concepts should be applied at every stage: planning, execution, and data analyses. The results were very exciting. Communication skills is an important aspect of the ABET process and the laboratory courses were used for effectively addressing this aspect of the education.

I taught Transport Phenomena II course for the first time in Spring, 2002 and the effort represented a total revamp of the course that had been taught previously. I also developed a Study Abroad program at the Imperial College London, beginning in Summer 2008.

My teaching has been recognized by students' evaluations, as well as by the number of awards (total 17) as an outstanding teacher over the years. I have experimented with Socratic approach to engage students by posing questions in the middle of lectures. However, larger class size poses a challenge to having an interactive learning environment. I have also led voluntary recitations in the introductory material and energy balances course.

I would continue to innovate and improve by trying various approaches for larger classes. We should engage the faculty in providing the best learning experience to our students by using a combination of lecture-recitation model, undergraduate teaching assistants, graduate teaching assistants, and extra faculty support (outside the lecture periods). The faculty can be committed to classroom teaching, while being engaged in research activity. My goal would be to channel that commitment towards continuing to provide excellent learning experience for the students within the available resources. There are always opportunities to explore and experiment in this arena.

V. RESEARCH

Sixteen doctoral students and thirteen master's students have been supervised in the general area of heterogeneous catalysis and reaction engineering. Also, a total of ten post-doctoral fellows (8 in the last 8 years) have been supervised. Presently, I have three doctoral students and one post-doctoral fellow in the group.

The most significant accomplishment during the last eight years has been to develop external funding (from both Federal agencies and industry). In addition to continuing heterogeneous catalysis research, my new research efforts have included high temperature pyrolysis and gasification of (i) biomass, (ii) biomass blends (with coal), and (iii) municipal solid waste. As a PI/PD on these topics, I am pleased to be engaged

in this field. We are making headway in developing a basis for generalized approach to how one sees various biomass species that differ widely in chemical composition and particularly inorganic ash species. Our research effort would make it possible to translate knowledge from one biomass species to another. The results obtained to date have significantly added to understanding the science and technical underpinnings of gasification at high heating rates (commercial-scale fluidized bed or entrained flow reactors). Recent projects include using renewable biomass as a source of fuels and feedstock. Of particular interest is pyrolysis and gasification of biomass and biomass-coal blends. In the field of catalysis, syngas conversion to higher alcohols, development of catalysts for reduced coking in cracking have been of interests in the past six years.

VI. ADMINISTRATIVE EXPERIENCE

As Associate Chair for Undergraduate Studies in the School of Chemical & Biomolecular Engineering at Georgia Tech since fall 2006, I have devoted 25-30% of my time in administrative role. This administrative role comprises three main components: (i) overseeing all aspects of the undergraduate program, including curricula matters and academic advisement, (ii) making teaching assignments for all faculty members and follow-up on their teaching evaluations, and (iii) ABET accreditation during 2008 and 2014 cycles. The U.S. News & World Report ranked the ChBE undergraduate program as ninth in 2009, the first time it appeared among the top ten. That rank has steadily climbed to fourth place in 2016. Although many find the USNWR ranking criteria controversial, the trajectory of our rankings is consistent with other metrics. The undergraduate program is collective responsibility of the entire ChBE faculty and administration, and I am proud to have played my part in this journey.

Several initiatives were undertaken during the past ten years to better serve the undergraduate education. Some of these include: (i) two track approach for undergraduate advisement – academic advisor and faculty mentor, (ii) peer mentor program where upper classmen mentor underclassmen, and (iii) student ambassador program-where current students provide a bridge to the prospective students and newly admitted students. These last two activities also help build the vital leadership skills of the students. A program of this magnitude involves serving the needs of a diverse constituency of students. Nearly 16% of ChBE undergraduates are under-represented minorities whose needs can sometimes require an extra effort. Nearly 11% of our undergraduate students are international students. School outreach efforts and garnering industrial support for such initiatives (e.g., STEPS program) are key components to the success.

I also served as faculty advisor to the AIChE student chapter from 1988 to 2005. The chapter emerged strongly during these years and was recognized as an outstanding chapter nationally in 14 of those 17 years. We developed a strategy of building partnerships with the industry to support the Chapter, without draining industrial support for the School as such. The AIChE student chapter organized weekly presentations by industrial visitors, while also promoting many social activities. In a program as large as GT, these soft skill development and social interactions lessen the impact of large size and bring a human dimension to the overall educational environment. The Chapter hosted two successful Southern Regional Conferences (1991 and 2004) where more than 300 students from ~ 25 southeastern chemical engineering programs participated.

I have a history of successful collaboration with industrial partners as a researcher, as AIChE faculty advisor, and as Associate Chair for Undergraduate Studies. I have also collaborated in my research efforts with materials scientists and chemists. It is critical that we build a culture of cross-disciplinary collaboration in order to work on major issues facing the society, e.g., energy, water, environment etc. Several new frontiers are emerging in which chemical engineering discipline would play a major role, but at the same time it must engage with other disciplines to be effective and competitive.

VII. RESEARCH GUIDANCE

A. INDIVIDUAL STUDENT GUIDANCE

A1. Post-doctoral Fellows

- Dr. Ildar Musin (post-doctoral fellow) April, 2015 - present
Co-advised with Dr. Carsten Sievers
Working on High Temperature Biomass and MSW Pyrolysis and Gasification to Produce Syngas (funded by the Dow Chemical Company)
- Dr. Olga Simakova (post-doctoral fellow) January 2013 –December 2013
Co-advised with Dr. Carsten Sievers
Worked on low-temperature pyrolysis of biomass to produce bio-oils (funded by the Dow Chemical Company)
Presently working with the Dow Chemical Company (Freeport, Texas)
- Dr. Pranjal Kalita (post-doctoral fellow) January 2012-December 2012
Co-advised with Dr. Carsten Sievers
Worked on low-temperature pyrolysis of biomass to produce bio-oils (funded by the Dow Chemical Company)
Presently working with for the Indian Ministry on Renewable Biomass (Delhi)

- Dr. Tien Thao Nguyen (post-doctoral fellow) Fall 2008-Summer 2010
 Co-advised with Dr. Christopher Jones
 Worked on synthesis of higher alcohols from syngas mixture (funded by the Dow Chemical Company)
 Presently a faculty member at the National University of Vietnam
- Dr. Jun Huang (post-doctoral fellow) Fall 2008-June 2009
 Co-advised with Dr. Christopher Jones
 Worked on zeolitic upgrading of bio-oil compounds (funded by the Chevron Research Corporation)
 Presently a faculty member at the University of Sydney (Australia)
- Dr. Teresita Marzioletti (post-doctoral fellow) November 2006-December 2010
 Co-advised with Dr. Christopher Jones
 Worked on aqueous phase hydrolysis of lignocellulosic biomass as a pathway for fuels and chemicals (funded by the Chevron Research Corporation)
 Presently a faculty member at the University of Concepcion (Chile)
- Dr. Do-Young Hong (post-doctoral fellow) September 2007-August 2009
 Co-advised with Dr. Christopher Jones
 Worked on hydrodeoxygenation of bio-oil compounds over bifunctional zeolites-based catalysts” (funded by the Chevron Research Corporation)
 Presently at KRICT, Korea
- Dr. Carsten Sievers (post-doctoral fellow) January 2007-July 2008
 Co-advised with Dr. Christopher Jones
 Worked on NMR and Ionic Liquid studies of loblolly pine hydrolysis (funded by the Chevron Research Corporation)
 Presently a faculty member in the School of Chemical & Biomolecular Engineering at the Georgia Institute of Technology
- Dr. Limin He (post-doctoral fellow) January 2003 – June 2004
 Worked on the development of an analytical approach for measuring and optimizing the fuel efficiency of dryers in the textiles industry (funded by CCACTI)
 Presently a research engineer in China

A2. Ph.D. Students

- Sireesha Aluri (PhD student) Fall 2013 – Spring 2018 (expected)
 Co-advised with Dr. John Muzzy and Dr. Carsten Sievers
 Research project involves the pyrolysis and gasification of municipal solid waste (MSW) and blends of MSW and low rank coals to produce syngas (funded by the Dow Chemical Company)
 passed the written and oral PhD qualifying examinations; expected to defend thesis proposal in summer 2015

- Shilpa Mahamulkar (PhD student) Fall 2012 –Spring 2017 (expected)
Co-advised with Dr. Christopher Jones
Research project involves developing anti-coking materials for steam crackers (funded by the Dow Chemical Company)
passed the written and oral PhD qualifying examinations; also defended thesis proposal in July 2014
- Micaela Tabora (PhD student) Fall 2012 –Summer 2016
Co-advised with Dr. Christopher Jones
Research project involves understanding reaction pathways for higher alcohol synthesis over MoS₂. K-promoted, MgAl oxide supported catalysts
Working as research engineer at ExxonMobil Corp.
- Mohmed A Syed (PhD student) Fall 2012 – May 2016
Co-advised with Dr. Carsten Sievers
Research project involves high temperature pyrolysis and gasification of biomass and blends of biomass and low rank coals to produce syngas (funded by the Dow Chemical Company)
Working as research engineer at Dow Chemical Company
- Gautami N Newalkar (PhD student) Fall 2010 –Spring 2015
Co-advised with Dr. Carsten Sievers
Research project involved high temperature pyrolysis and gasification of biomass and blends of biomass and coals (funded by the US DOE)
Working as Process Research Engineer with Intel
- Michael Morrill (PhD student) Fall 2008 – Summer 2013
Co-advised with Dr. Christopher Jones
Research project involved development of MMO-supported, alkali-promoted MoS_x catalysts for higher alcohol synthesis from syngas mixtures (funded by the Dow Chemical Company)
Since completing PhD in Summer 2013, working as a research engineer with the Phillips 66 (Oklahoma)
- Weiyin Xu (PhD student) Fall 2008 – Summer 2013
Co-advised with Dr. Christopher Jones
Research project involved upgrading of lignin-derived species via mono-functional and bi-functional catalysts (partially funded by the Chevron Research Corp)
Since completing PhD in Summer 2013, working as a research engineer in a Singapore Government Laboratory
- Mariefel B. Valezuela-Olarte (PhD student) January 2007 – March 2010
Co-advised with Dr. Christopher Jones

Research project involved lignin depolymerization and catalytic hydrodeoxygenation of depolymerized lignin model compounds (funded by the Chevron Research Corp)

Since completing PhD in Spring 2010, working as a research engineer at PNNL

Viboon Sricharoenchaikul (PhD student) August 1997 – May 2001

Co-advised with Dr. W. James Frederick (IPST)

Research project involved gasification of Kraft black liquor and catalytic conditioning of condensable organics (funded by the US DOE)

Presently a faculty member at the Chulalongkorn University in Thailand

Sundararaman Vaidyaraman (PhD student) August 1992- July 1995

Co-advised with Dr. W. Jack Lackey (GTRI)

Research project involved the formation of carbon-carbon composites by forced flow thermal gradient chemical vapor infiltration (FCVI) process, funded by AFOSR

Presently employed by Aircraft Braking Systems Corporation, Akron, Ohio

Woo Y. Lee (PhD student) September 1988- August 1991

Co-advised with Dr. W. Jack Lackey (GTRI)

Research project involved chemical vapor deposition (CVD) of dispersed phase ceramic composites, funded by AFOSR

Presently Chair, Department of Materials Science and Engineering at the Stevens Institute of Technology, New Jersey

Donald Simmons (PhD student) September 1986 – May 1990

Co-advised with Dr. Sheldon W. May (Chemistry)

Research project involved L-DOPA production in a liquid membrane enzyme reactor – process development and modeling (funded through NSF Fellowship)

Presently senior engineer at the Expert Polymer Engineering (Atlanta)

Vinayan Nair (PhD student) September 1985 – August 1988)

Co-advised with Dr. Tudor L. Thomas (GTRI)

Research project involved modification of ferrisilicate molecular sieve catalysts for shape-selective applications

Presently employed by the UOP, Inc, Des Plaines, IL

John N Kostas (PhD student) September 1981 – June 1986

Research project involved temperature-programmed studies of alkali-promoted Ni/SiO₂ catalysts in CO hydrogenation

Presently senior research engineer with Ashland Chem. Corp, Wilmington, DE

Scott T. McMillan (PhD student) September 1981 – August 1985

Research project involved gas-phase hydrogenation of butyronitrile over supported platinum catalysts (funded partially by the Dow Chemical Co)
Presently employed by Amag Pharmaceuticals

Billy K Huh (PhD student) September 1981 –August 1985

Research project involved structural effects in Fischer-Tropsch synthesis over bimetallic supported catalysts (funded partially by the ACS Grant)
Presently medical doctor

A3. M.S. Students

Roxy Zhou (M.S. with thesis) Fall 2011 –Summer 2013

Co-advised with Dr. Christopher Jones
Research project involved conversion of monomeric lignin fragments into cyclohexanols for renewable Nylon 6 production, supported with PSE fellowship
Completed thesis in August 2013, employed by Fisher International (Boston)

Hiroko Okatsu (M.S. with thesis) Fall 2010 –Summer 2012

Co-advised with Dr. Christopher Jones
Research project involved higher alcohol synthesis over supported MoS₂ and Mo₂C catalysts (funded by the Dow chemical Company)
Completed thesis in July 2012, employed by Kaneka (Japan)

Travis J. C. Hoskins (M.S. with thesis) Fall 2006 – Summer 2008

Co-advised with Dr. Christopher Jones
Research project involved carbon-carbon bond-forming reactions of biomass-derived aldehydes (funded by Chevron Research Corporation)
Completed thesis in July 2008, employed by Siemens

Mariefel B. Valenzuela-Olarte (M.S. with thesis) Fall 2004 – Fall 2006

Co-advised with Dr. Christopher Jones
Research project involved batch aqueous phase reforming of woody biomass to produce hydrogen in a single pot process (funded by PSE fellowship)
Completed thesis in September, 2006 and returned to the Phillipines for a few months before coming back in January 2007 to work on doctoral research

Li Xue (M.S. with thesis) Fall 2002 – Summer 2004

Research project involved modeling the drying of carpet based on transport-based mathematical description (funded by CCACTI)
Completed thesis in Summer 2004, employed as an engineer in Pittsburgh

Tonya Hicks (M.S. with thesis) Fall 2002 – Summer 2004

Research project involved preparation of mono-dispersed catalysts using reverse-micelles and examining the activity in ethylene hydrogenation/hydrogenolysis reactions

Completed thesis in Summer 2004, employed by the U.S. Department of Homeland Security

Anil Amlani (M.S. thesis) Fall 2000 – Summer 2002

Coadvised with Dr. Kristiina Iisa (IPST)

Research project involved development of sulfur-tolerant tar destruction catalysts (funded by the US DOE)

Completed thesis in Summer 2002, employed by the Fluor Corporation (Tampa)

Sundararaman Vaidyaraman (M.S. thesis) Fall 1990 – Summer 1992

Research project involved developing kinetic model of the Bosch reaction (NASA funded)

Completed thesis in Summer 1992, and continued towards PhD project jointly with Dr. W. Jack Lackey

Betsy Kuo (M.S. thesis) Fall 1989 – Summer 1991

Research project involved an understanding of the alkoxylation kinetics to narrow the molecular weight distribution of linear alcohol ethoxylates (funded by the Milliken and Company)

Completed thesis in Summer 1991, employed by Cryovac, Greenville, SC

Charles A. Hall (M.S. thesis) Fall 1986 – Summer 1988

Research project involved understanding the role of kinetics and mass transfer in batch alkoxylation reactions (funded by the Milliken and Company)

Completed thesis in Summer 1988, currently Vice-President of Manufacturing, Barnett Company, SC

Kwaku Temeng (M.S. thesis) Fall 1982 – Summer 1984

Research project involved kinetics of CO hydrogenation over potassium-promoted Ni/SiO₂ catalysts.

Completed thesis and went to work with another faculty for his PhD, employed by Aramco

Anthony Jackson (M.S. thesis) Fall 1982 – Summer 1984

Research project involved using Pd/SiO₂ + ZSM-5 zeolite bi-functional catalysts for syngas-to-methanol-to-higher hydrocarbons

Completed thesis in Summer 1984, presently Senior Vice-President for Business Development and Marketing for TAG holdings in Michigan

Gary D Garner (M.S. thesis) Fall 1979 – Summer 1981

Research project involved a TPR/TPD study of CO and H₂ interactions with supported Ni catalysts

Completed thesis in Summer 1981, employed by 3M corporation, MN

A4. Undergraduate Students

More than 60 undergraduate students have worked as undergraduate research students over the years. Below is a list of 29 students who have worked in the last 5 years.

Kathryn Black
Alison Carr
Taylor Donnell
Anna Elgqvist
Matthew Ellis
Victoria Falk
Brice Fouduop
Erin Hogan
Marion Juren
Michael Kenna
Anu Lal
Shikin Lockman
Davina Morrow
Erin McCaskey
Molly McLaughlin
Divya Nagarkar
Danish Parbtani
Garrett Pouria
Karina Psareva
Yurancy Quinones
Corey Randall
Alison Rogers
Christopher Schmitt
Athina Smick
Hursh Sureka
Jamilat Taiwo
Andrew Tricker
Brandt Tyson
Nalini Patel

A5. Service on Thesis or Dissertation Committees

I have served on the following 23 doctoral dissertation committees and 2 M.S. thesis committees in the past five years:

Linda Al-Hmoud
Naoki Bessho
Dhaval Bhandari
Nitech Bhuvania
Ling Chen
Tae-Seop Choi

Yu Han Chu
Michael Dutzer
Jessica Ewbank
Christine Fleming (M.S.)
Guo Shiou Foo
Jeong Woo Han
John Hessler
Pakkapol Kanchanalai
Shweta Karwa
Fu Yue Li
Liwei Li
Di Lu
Sarah McNew
Wei Mu
Xue Ning
Eric Peng
Benjamin Sheyko (M.S.)
Johanna Stark
Graham Wenz

A6. Mentorship of Visiting Students/Scholars/Teachers

Husseyin Arabag (Turkey)
Professor Edelio Taboada Valdes (Chile)

VIII SCHOLARLY ACCOMPLISHMENTS

A. PUBLISHED BOOKS AND PARTS OF BOOK

Bartholomew, C. H., **P. K. Agrawal**, and J. R. Katzer, "Sulfur Poisoning of Metal Catalysts", *Advances in Catalysis*, 31, 135-242 (1982)

B. REFEREED PUBLICATIONS

Agrawal, P.K., W.K. Lee, J. M. Lornston, C. I. Richardson, K. F. Wissbrun, and A.B. Metzner, "Rheological Behavior of Molten Polymers In Shearing and in Extensional Flows", *Trans. Soc. Rheol.* 21, 355-379 (1977).

Tsai, J., **P. K. Agrawal**, D. R. Sullivan, J. R. Katzer, and W. H. Manogue, "SO₂ Deactivation in NO Reduction by NH₃: AES Studies of Deactivated Catalysts in NO Reduction", *ACS Div. Of Petroleum Chemistry*, 22 (4), 1232-1247 (1977).

Tsai, J., **P. K. Agrawal**, J. M. Foley, J. R. Katzer, and W. H. Manogue, "SO₂ Deactivation in NO Reduction by NH₃: III. Auger Studies of Deactivated Catalysts", *J. Catalysis*, 61, 192-203 (1980).

Tsai, J., **P. K. Agrawal**, D. R. Sullivan, J. R. Katzer, and W. H. Manogue, "SO₂ Deactivation in NO Reduction by NH₃: IV. AES Studies of Deact. Catalysts in Selective NO Reduction", *J. Catal.*, 61, 204-215 (1980).

Agrawal, P. K., W. D. Fitzharris, and J. R. Katzer, "Sulfur and Carbon Deactivation of Transition Metal Catalysts", *Stud. Surf. Sci. Catal.*, 6, 179 (1980).

Agrawal, P. K., J. R. Katzer, and W. H. Manogue, "Methanation over Transition Metal Catalysts: II. Carbon Deactivation of Co/Al₂O₃ in Sulfur-Free Studies", *J. Catal.*, 69, 312-326 (1981).

Agrawal, P. K., J. R. Katzer, and W. H. Manogue, "Methanation over Transition Metal Catalysts: III. Co/ Al₂O₃ in Sulfur-Poisoning Studies", *J. Catalysis*, 69, 327-344 (1981).

Agrawal, P. K., J. R. Katzer, and W. H. Manogue, "Methanation over Transition Metal Catalysts: V. Ru/ Al₂O₃ Surface and Reaction Studies of Poisoning with H₂S", *J. Catalysis*, 74, 332-342 (1982).

Agrawal, P. K., J. R. Katzer, and W. H. Manogue, "Methanation over Transition Metal Catalysts: IV. Co/ Al₂O₃ – Rate Behavior and Kinetic Modeling", *Ind. & Eng. Chem.-Fund*, 21, 385 (1982).

Simmons, D. K., **P. K. Agrawal**, R. Szostak, and T. L. Thomas, "Gallosilicate Molecular Sieves: The Role of Framework and Nonframework Gallium on Catalytic Cracking Activity", *J. Catalysis*, 106, 287-291 (1987).

McMillan, S. T. and **P. K. Agrawal**, "The Gas-Phase Hydrogenation of Butyronitrile over Supported Pt Catalysts", *Ind. & Eng. Chem. Res.*, 27, 243 (1988).

Agrawal, P. K. and J. T. Sommerfeld, "The Milliken/Georgia Tech Rising Senior Summer Program", *Chem. Eng. Education*, 21(3), 134 (1987).

Nair, V., R. Szostak, **P. K. Agrawal**, and T. L. Thomas, "Modified Ferrisilicate Molecular Sieve Catalysts for Shape-selective Application", In Proceedings of the Tenth North American Catalysis Society Meeting", San Diego, April, 1987.

Hall, C. A. and **P. K. Agrawal**, "Separation of Kinetics and Mass-Transfer in a Batch Alkoxylation Reaction", *Can. J. Chem. Eng.*, 68, 104 (1990).

Simmons, D. K., S. W. May, and **P. K. Agrawal**, "Enzymes in Liquid Membranes: Reaction and Bioseparation", *ACS Symposium Series:Downstream Processing and*

Bioseparation- Recovery and Purification of Biological Products, Eds. J. Hamel, J. B. Hunter, and S. K. Sikdar, 419, 108-129 (1990).

Lee, W. Y., W. J. Lackey, and **P. K. Agrawal**, “Dispersed-Phase Boron Nitride-Aluminum Nitride Composites Prepared by CVD”, *Proceedings Electrochemical Soc.*, 90(12), 580-588 (1990).

Misra, A. K., N. K. Bose, N. Uyamadu, and **P. K. Agrawal**, “Preliminary Evidence for a Phage in Syngas Utilizing *Clostridium Thermoaceticum*”, *Resources, Conservation and Recycling*, 3, 187-89 (1990).

Lee, W. Y., W. J. Lackey, and **P. K. Agrawal**, “Dispersed-Phase Boron Nitride-Aluminum Nitride Composites Prepared by CVD”, *Proceedings Electrochemical Soc.*, 90 (12), 580-588 (1990).

Lee, W. Y., W. J. Lackey, and **P. K. Agrawal**, “Thermodynamic and Kinetic Analyses of Chemical Vapor Deposition of Aluminum Nitride”, *J. Amer. Ceramic Soc.*, 74(8), 1821-1827 (1991).

Lee, W. Y., **P. K. Agrawal**, and W. J. Lackey, “Kinetic Analyses of Chemical Vapor Deposition of Boron Nitride”, *J. Amer. Ceramic Soc.*, 74 (10), 2642-48 (1991).

Lee, W. Y., W. J. Lackey, **P. K. Agrawal**, and G. B. Freeman, “Simultaneous Chemical Vapor Deposition of Boron Nitride and Aluminum Nitride”, *J. Amer. Ceramic Soc.*, 74(10), 2649-58 (1991).

Lee, W. Y., W. J. Lackey, G. B. Freeman, **P. K. Agrawal**, and D. J. Twait, “Preparation of Dispersed Phase Ceramic Boron Nitride and Aluminum Nitride Composite Coatings by Chemical Vapor Deposition”, *J. Amer. Ceramic Soc.*, 74 (9), 2136-40 (1991).

Vaidyaraman, S., W. J. Lackey, G. B. Freeman, **P. K. Agrawal**, and M. D. Langman, “Fabrication of Carbon-Carbon Composites by Forced Flow-Thermal Gradient Chemical Vapor Infiltration (FCVI)”, *J. Materials Research*, 10(6), 1469-77 (1995).

Lackey, W. J., S. Vaidyaraman, **P. K. Agrawal**, and G. B. Freeman, “Technique for Monitoring Densification During Chemical Vapor Infiltration”, *J. Amer. Ceramic Soc.*, 78 (4), 1131-33 (1995).

Vaidyaraman, S., W. J. Lackey, **P. K. Agrawal**, and G. B. Freeman, “Forced Flow-Thermal Gradient Chemical Vapor Infiltration (FCVI) for Fabrication of Carbon/Carbon”, *Carbon*, 33(9), 1211-15 (1995).

- Vaidyaraman, S., W. J. Lackey, **P. K. Agrawal**, G. B. Freeman, and M. D. Langman, "Rapid Processing of Carbon-Carbon Composites by Forced Flow-Thermal Gradient Chemical Vapor Infiltration (FCVI)", in *Materials Research Society Symposium Proceedings*, 365, 325-330 (1995).
- Lackey, W. J., S. Vaidyaraman, G. B. Freeman, **P. K. Agrawal**, and M. D. Langman, "Rapid Fabrication of carbon-Carbon Composites", *American Ceramic Society Proceedings*, 1995.
- Vaidyaraman, S., W. J. Lackey, **P. K. Agrawal**, and M. A. Miller, "Carbon-Carbon Processing by Forced Flow-Thermal Gradient Chemical Vapor Infiltration (FCVI) using Propylene", *Carbon*, 34(3), 347-362 (1996).
- Vaidyaraman, S., W. J. Lackey, and **P. K. Agrawal**, "Carbon-Carbon Processing by Forced Flow-Thermal Gradient Chemical Vapor Infiltration (FCVI) using Propane", *Carbon*, 34(5), 609-617 (1996).
- Lewis, J. S., S. Vaidyaraman, W. J. Lackey, **P. K. Agrawal**, G. B. Freeman, and E. K. Barefield, "Chemical Vapor Deposition of Boron- Carbon Films using Organometallic Reagents", *Material Letters*, 27, 327- (1996).
- Vaidyaraman, S., W. J. Lackey, **P. K. Agrawal** and T. L. Starr, "1-D Model for Forced Flow-Thermal Gradient Chemical Vapor Infiltration Process for Carbon", *Carbon*, 34(9), 1123-33 (1996).
- Agrawal, P. K.**, "Integration of Critical Thinking and Technical Communication into Undergraduate Laboratory Course", *Proceedings of American Society of Engineering Education*, 1997.
- Agrawal, P. K.** and J. T. Sommerfeld, "Research Rankings of Indian Chemical Engineering Schools by International Literature Publications", *Chemical Business*, pp. 35-39, August, 1998.
- Agrawal, P. K.** and J. T. Sommerfeld, "Capital Investment Costs for 85 Specialty and Low Volume Chemical Plants", *Chemical Business*, pp. 45- 7, February, 1999.
- Godavarty, A., A. Sheth, Y.D. Yeboah, Y. Xu, and **P.K. Agrawal**, "Catalytic Gasification of Coal using Eutectic Salts: Identification of Eutectics", *Carbon*, 41(2), 203-214 (2002).
- Sricharoenchaikul, V., W.J. Frederick, Jr., and **P.K. Agrawal**, "Black Liquor Gasification Characteristics. 1. Formation and Conversion of Carbon-Containing Product Gases", *Ind. Eng., Chem. Res.*, 41, 5640- 5649 (2002).

Sricharoenchaikul, V., W.J. Frederick, Jr., and **P.K. Agrawal**, “Black Liquor Gasification Characteristics. 2. Measurement of Condensable Organic Matter (Tar) at Rapid Heating Conditions”, *Ind. Eng. Chem. Res.*, 41, 5650-5658 (2002).

Godavarty, A. A. Sheth, Y.D. Yeboah, Y. Xu, and **P.K. Agrawal**, “Catalytic Gasification of Coal Using Eutectic Salts: Reaction Kinetics with Binary and Ternary Eutectic Salts”, *Fuel*, 82, 305-317 (2003).

Sheth, A., C. Sastry, Y.D. Yeboah, Y. Xu, and **P.K. Agrawal**, “Catalytic Gasification of Coal Using Eutectic Salts: Recovery, Regeneration and Recycle of Spent Catalysts”, *J. Air & Waste Management Association*, 53, xxx-xxx (2003).

Sricharoenchaikul, V., W.J. Frederick, Jr., and **P.K. Agrawal**, “Carbon Distribution in Char Residue from Gasification of Kraft Black Liquor”, *Biomass and Bioenergy*, xxx – xxx (2003).

Agrawal, P.K., K. Iisa, S.A. Sinquefield, and Anil Amlani, “Catalytic Reforming of Tars Formed During Black Liquor/Biomass Gasification”, Proceedings of the 2003 TAPPI Fall Technical Conference, 2003.

Agrawal, P.K. and Li Xue, “Development of a Mathematical Model for the Drying of Textile Fabrics”, Proceedings of the 3rd International Industrial Simulation Conference, pp. 367-371 (2005).

Valenzuela, Mariefel B., C. Jones and **P. K. Agrawal**, “Batch Aqueous-Phase Reforming of Woody Biomass”, *Energy and Fuels*, 20, 1744-1752 (2006).

Marzialetti, T., M. B. Valenzuela-Olarte, C. Sievers, T. J. C. Hoskins, **P. K. Agrawal**, and C. W. Jones, “Dilute Acid Hydrolysis of Loblolly Pine: A Comprehensive Approach”, *Industrial & Engineering Chemistry Research*, 47, 7131-7140 (2008).

Sievers, C., M. B. Valenzuela-Olarte, T. Marzialetti, **P. K. Agrawal**, and C. W. Jones, “Ionic liquid Phase Hydrolysis of Pine Wood”, *Industrial & Engineering Chemistry Research*, 48, 1277-1286 (2009).

Sievers, C, I. Musin, T. Marzialetti, M. B. Valenzuela-Olarte, **P. K. Agrawal**, and C. W. Jones, “Acid-catalyzed Conversion of Sugars and Furfurals in an Ionic Liquid Phase”, *ChemSusChem*, 2, 665-671 (2009).

Sievers, C, T. Marzialetti, Travis J. C. Hoskins, M. B. Valenzuela-Olarte, **P. K. Agrawal**, and C. W. Jones, “Quantitative Characterization of Residues from Acid Hydrolysis of Pine Wood by Solid State NMR”, *Bioresource Technology*, 100, 4758-4765 (2009).

Huang, Jun, W. Long, **P. K. Agrawal**, and C. W. Jones, “Effects of Acidity on the Conversion of the Model Bio-oil Ketone Cyclopentanone on H-Y Zeolites”, *Journal Physical Chemistry C*, 113, 16702-16710 (2009).

Hong, D. Y., S.J. Miller, **P.K. Agrawal**, and C.W. Jones, “Hydrodeoxygenation and Coupling of Aqueous Phenolics over Bifunctional Zeolite-supported Metal Catalysts”, *Chemical Communications*, 46, 1038-1040 (2010).

Marzialetti, Teresita, Miller, Steve J., Jones, Christopher W., and **Agrawal, Pradeep K.**, “Switchgrass Pretreatment and Hydrolysis Using Low Concentrations of Formic Acid”, *Journal of Chemical Technology and Biotechnology*, 86(5), 706-713 (2011).

Marzialetti, T., S. J. Miller, C. W. Jones, and **P. K. Agrawal**, “Switchgrass Hydrolysis using Aqueous Formic Acid: A Mineral Acid-Free Strategy for Biomass Pretreatment and Hydrolysis”, *Bioresource Technology*, 2011.

Hong, Do Young, Miller Steve J, **Agrawal, Pradeep K.** and Jones, Christopher W., “Bifunctional Pt-H-Y Zeolite Catalysts for Upgrading of Phenol into Fuel Range Hydrocarbons”, *Chemical Communications* (2010)

Morrill, M. R., N. T. Thao, **P. K. Agrawal**, C. W. Jones, R. J. Davis, H. Shou, D. Barton, and D. Ferrari, “Mixed MgAl Oxide Supported Potassium Promoted Molybdenum Sulfide as a Selective Catalyst for Higher Alcohol Synthesis from Syngas.” *Catal. Lett.*, 142, 875-881 (2012).

Xu, W., S. J. Miller, **P. K. Agrawal**, and C. W. Jones, “Depolymerization and Hydrodeoxygenation of Switchgrass Lignin with Formic Acid”, *ChemSusChem* 5, 667-675 (2012).

Li, L., M.R. Morrill, H. Shou, D.G. Barton, D. Ferrari, R.J. Davis, **P. K. Agrawal**, C.W. Jones, and D.S. Sholl, “On the relationship between Mo K-Edge Energies and DFT Computed Partial Charges”, *J. Physical Chemistry C*, 117, 2769-2773 (2013).

Morrill, M.R., N.T. Thao, H. Shou, R.J. Davis, D.G. Barton, D. Ferrari, **P.K. Agrawal**, and C.W. Jones, “Origins of Unusual Alcohol Selectivities over Mixed MgAl Oxide Supported MoS₂ Catalysts for Higher Alcohol Synthesis from Syngas”, *ACS Catalysis*, 3, 1665-1675 (2013).

Xu, W., S.J. Miller, **P.K. Agrawal**, and C.W. Jones, “Zeolite Topology Effects in the Alkylation of Phenol with Propylene”, *Applied Catalysis A*, 459, 114-120 (2013).

Xu, W., S.J. Miller, **P.K. Agrawal**, and C.W. Jones, “Positive Effect of water on Zeolite BEA Catalyzed Alkylation of Phenol with Propylene”, *Catalysis Letters*, 1167 (2013).

Okatsu, H., M. R. Morrill, H. Shou, D. G. Barton, D. Ferrari, R. J. Davis, **P. K. Agrawal**, and C. W. Jones, “Supported K/MoS₂ and K/Mo₂C Catalysts for Higher Alcohol Synthesis from Synthesis Gas: Impact of Molybdenum Precursor and Metal Oxide Support on Activity and Selectivity”, *Catalysis Letters*, 144 (2014) 825-830.

Newalkar, G., K. Iisa, A. D. D’Amico, C. Sievers, and **P. K. Agrawal**, “Effect of Temperature, Pressure, and Residence Time on Pyrolysis of Pine in an Entrained Flow Reactor”, *Energy & Fuels* 28(8), 5144-5157 (2014).

Taborga Claire, M., S.H. Chai, S. Dai, K. A. Unocic, F. M. Alamgir, **P.K. Agrawal**, and C.W. Jones, "Tuning of Higher Alcohol Selectivity and Productivity in CO Hydrogenation Reactions over K/MoS₂ Domains Supported on Mesoporous Activated Carbon and Mixed MgAl Oxide", *J. Catalysis* **32**, 88-97 (2015).

Taborga Claire, M. M. R. Morrill, J. W. Goh, S.H. Chai, S. Dai, **P.K. Agrawal**, and C. W. Jones, "Insight into Reaction Pathways in CO Hydrogenation Reactions Over K/MoS₂ Supported Catalysts via Alcohol/Olefin Co-Feed Experiments", *Catal. Sci. Technol.* 2016, **6**, 1957-1966.

Sulmonetti, T. P., S. H. Pang, M. T. Taborga, S. Lee, D. A. Cullen, **P. K. Agrawal**, and C. W. Jones, "Vapor Phase Hydrogenation of Furfural over Nickel Mixed Oxide Catalysts Derived from Layered Double Hydroxides", *Applied Catalysis A: General* 517, 187-195 (2016)

Mahamulkar, S., K. Yin, R. Davis, H. Shibata, A. Malek, C. W. Jones, and **P. K. Agrawal**, "In-situ Generation of Radical Coke and the Role of Coke-Catalyst Contact on Coke Oxidation", *Ind. Eng. Chem. Res.*, 55(18), 5271-5278 (2016)

Mounfield, W., M. T. Claire, **P. K. Agrawal**, C. W. Jones, and K. Walton, "Synergistic Effect of Mixed Oxide on the Adsorption of Ammonia with Metal-Organic Frameworks", *Ind. Eng. Chem. Res.*, 55 (22), 6492-6500 (2016)

Taborga Claire, M., Li-Chen Lee, J. W. Goh, L. Gelbaum, **P.K. Agrawal**, and C. W. Jones, "Assessing C3-C4 Alcohol Synthesis Pathways over a MgAl Oxide Supported K/MoS₂ Catalyst via 13C₂-Ethanol and 13C₂-Ethylene Co-Feeds", *J. Molecular Catalysis A Chemical* (423) 224-232 (2016)

Mahamulkar, S., K. Yin, **P.K. Agrawal**, R. Davis, C. W. Jones, A. Malek, and H. Shibata, "On the Formation and Oxidation/Gasification of Carbonaceous Deposits – a Review", *Ind. Eng. Chem. Res.*, 55 (37) 9760-9818 (2016)

Yin, Kehua, R. J. Davis, S. Mahamulkar, C. W. Jones, **P. K. Agrawal**, H. Shibata, and A. Malek, "Catalytic Oxidation of Solid Carbon and Carbon Monoxide over Cerium-Zirconium Mixed Oxides", *AIChE Journal* 725-738 (2017)

Yin, K., S. Mahamulkar, J. Xie, H. Shibata, A. Malek, L. Li, C.W. Jones, **P. K. Agrawal**, and R. J. Davis, "Catalytic Reactions of Coke with Dioxygen and Steam over Alkaline earth metal-doped Cerium-Zirconium Mixed Oxides", accepted for publication in *J. Applied Catalysis A:General* (2017)

C. OTHER PUBLICATIONS

Patents and Invention Disclosures

Jones, C. W. and **P. K. Agrawal**, "Hydrogen Production from Biomass", U.S. Patent 7,972,587 (2011).

Marzialetti, T., C. W. Jones, and **P. K. Agrawal**, "Formic Acid Treatment of Biomass Feedstock", U.S. patent application (Serial No. 12/782,197) filed May 18, 2010.

C. W. Jones, N.T. Thao, and **P. K. Agrawal**, "Synthesis of C_2^+ Alcohols from Syngas over K/Mo/Mg (Al)O_x Catalysts", Invention Disclosure filed June, 2010.

C. W. Jones, N.T. Thao, and **P. K., Agrawal**, "Carbon-Supported catalysts for Production of Higher Alcohols from Syngas", U.S. Patent 8,999,876 (2015).

D. PRESENTATIONS

Huh, B. K. and **Agrawal, P.K.**, "Bimetallic Supported Clusters (Ru-Cu/SiO₂) in Fischer-Tropsch Synthesis," presented by P. K. Agrawal at the "Eight North American Catalysis Society Meeting, "Philadelphia, May, Also presented by P. K. Agrawal at the "57th Colloid and Surface Science Symposium," Toronto, June 10-13, 1983.

McMillan, S. T. and **Agrawal, P.K.**, "Hydrogenation vs. Hydrogenolysis Selectivity of Supported Pt Catalysts in Butyronitrile Reduction," presented by S. T. McMillan at the AIChE National Meeting, Atlanta, March 12-14, 1984.

Nair, V., R. Szostak, **P.K. Agrawal**, and T. L. Thomas, "Modified Ferrisilicate Molecular Sieve Catalysts for Shape-Selective Applications," presented by V. Nair at the Colloid and Surface Science Symposium, June 1986.

Nair, V., R. Szostak, **P. K. Agrawal**, and T. L. Thomas, "Shape-Selective Probe Reactions to Characterize Ferrisilicate Molecular Sieves," presented by V. Nair at the Tenth North American Catalysis Society Meeting, San Diego, California 1987.

Hall, C. and **P. K. Agrawal**, "Separation of Kinetics and Mass-Transfer Effects in Batch Alkoxylation," presented by C. A. Hall at the Milliken and Company, Spartanburg, SC 1987.

Simmons, D. K., S. W. May and **P. K. Agrawal**, "Liquid-Membrane Encapsulation of a Tyrosinase/Ascorbate System for Isolation of Reactive Intermediate Oxidation Products," presented by D. K. Simmons at the Annual ACS Meeting held in Toronto in June 1988.

Lee, W. Y., **P. K. Agrawal**, D. J. Twait, G. B. Freeman and W. J. Lackey, "Chemical Vapor Deposition of Dispersed Phase Ceramic (AlN + BN) Composites," presented by W. Y. Lee at the Annual AIChE Meeting held in Washington, DC. In November/December 1988.

Hall, C. A. and **P. K. Agrawal**, "Separation of Kinetics and Mass-Transfer in a Batch Alkoxylation Reaction," presented by P. K. Agrawal at the Symposium on Multiphase Reactors at the AIChE Meeting held in Houston, April 1989.

Simmons, D. K., S. W. May and **P. K. Agrawal**, "Liquid-Membrane Encapsulation of Enzymes for the Isolation of Intermediate Products," presented by P. K. Agrawal at the Symposium on Bioseparations at the Annual AIChE Meeting held in Washington, D. C., November 1988.

Simmons, D. K., May, S. W. and **Agrawal, P. K.**, "Use of Liquid-Membrane Encapsulated Enzymes for the Isolation of Reactive Intermediate Products," presented by P. K. Agrawal at the 1989 AIChE Annual Meeting, San Francisco, Ca., November, 1989..

Lee, W. Y., Lackey, W. J., and **Agrawal, P. K.**, "Growth Behavior of Dispersed Phase Ceramic Composite Coatings Containing BN and AlN Prepared by Chemical Vapor Deposition," presented by W. Y. Lee at the 1989 AIChE Annual Meeting, San Francisco, Ca., November 1989.

Lackey, W. J., Lee, W. Y., **Agrawal, P. K.**, Hanigofsky, J. A. and Move, K. L., "Dispersed Phase BN + AlN Composite via Chemical Vapor Deposition," presented by W. J. Lackey at the American Ceramic Society Meeting, Dallas, Texas, April, 1990.

Simmons, D. K., **Agrawal, P. K.** and May, S. W., "L-DOPA Production in a Liquid Membrane Enzyme Reactor," presented by P. K. Agrawal at the 1990 AIChE Annual Meeting, Chicago, November, 1990.

Lee, W. Y., **Agrawal, P. K.**, and Lackey, W. J., "Preparation of Dispersed Phase Ceramic BN-AlN Composite Coatings by CVD," presented by P. K. Agrawal at the 1990 AIChE Annual Meeting, Chicago, November 1990.

Lee, W. Y., **Agrawal, P. K.** and Lackey, W. J., "Simultaneous CVD of Boron Nitride and Aluminum Nitride," presented by P. K. Agrawal at the 1991 AIChE Annual Meeting, Los Angeles, November 1991.

Agrawal, P. K., "The Role of AIChE Student Chapter in Undergraduate Education," presented at the 1991 AIChE Annual Meeting, Los Angeles, November 1991.

Vaidyaraman, S. and **Agrawal, P. K.**, "Transient and Kinetic Study of the Bosch Reaction", presented by S. Vaidyaraman at the 22nd International Conference on Environmental Systems, Seattle, Washington, July 13-16, 1992.

Vaidyaraman, S., **Agrawal, P. K.**, Lackey, W. J., and Hanigofsky, J. A., "CVD and CVI of B-Si-C Systems using Organometallic Reagents", presented by S. Vaidyaraman at the AIChE Annual Meeting, St. Louis, Mo., November, 1993.

Vaidyaraman, S., Lackey, W. J., **Agrawal, P. K.**, Freeman, G. B., and Langman, M.D., “Rapid Processing of Carbon-Carbon Composites by Forced Flow-Thermal Gradient Chemical Vapor Infiltration (FCVI)”, presented by S. Vaidyaraman at the Materials Research Society Symposium, Boston, November, 1994.

Agrawal, P. K. and Kann, K., “Integration of Critical Thinking and Technical Communication into Undergraduate Laboratory Courses”, presented by P. K. Agrawal at the AIChE Annual Meeting, Chicago, November, 1996.

Agrawal, P. K., “Integration of Critical Thinking and Technical Communication into Undergraduate Laboratory Courses”, presented by P. K. Agrawal at the 1997 ASEE Annual Conference, Milwaukee, WI, 1997.

Agrawal, P. K. and T. Britt, “Milliken/Georgia Tech Cooperative Education Program”, presented by P. K. Agrawal and T. Britt at the ASEE Meeting as an invited presentation, Savannah, Ga, 1998.

V. Sricharoenchaikul, **P.K. Agrawal**, K. Iisa, and W.J. Frederick, Jr., “Characterization and Destruction of Tars Produced During Low Temperature Black Liquor Gasification”, presented by V. Sricharo-Enchaikul at the 2001 International Chemical Recovery Conference, Vancouver, Canada, June, 2001.

Agrawal, P.K., Kristiina Iisa, and Anil Amlani, “Stability and Regenerability of Catalysts for the Destruction of Tars Formed During Low temperature Gasification of Biomass”, presented by P. K. Agrawal at the DOE Annual Review of the Agenda 2020 Forest Program , Denver, CO, June 2002.

Agrawal, P.K., Kristiina Iisa, and Anil Amlani, “Stability and Regenerability of Catalysts for the Destruction of Tars Formed During Low temperature Gasification of Biomass”, presented by P. K. Agrawal at the TAPPI meeting in San Diego, CA, September, 2002

Amlani A., **P. K. Agrawal** and K. Iisa, “Steam Reforming of Benzene over Tungsten Sulfide Catalysts”, presented by P. K. Agrawal at the Fall Symposium of the Southeastern Catalysis Society meeting, Asheville, N.Carolina, September, 2002.

Agrawal, P. K., A. Amlani, and K. Iisa, “Sulfur Tolerance of Group VIII-Group VIB catalysts for Steam Reforming of Benzene”, presented by P. K. Agrawal at the AIChE Annual Meeting in Indianapolis, IN, November, 2002.

Agrawal, P.K., K. Iisa, and S.A. Sinquefield, “Stability and regenerability of Catalysts for the Destruction of Tars Formed During Low Temperature Gasification of Biomass”, presented by P.K. Agrawal at the IEA Annex XV Meeting, Atlanta, February, 2003.

Agrawal, P.K. and L. Xue, “Development of Protocols for the Optimization of Dryer Operation for Improved Energy Efficiency”, presented by P.K. Agrawal at the CCACTI Project Review Meeting, Athens, Georgia, February, 2003.

Agrawal, P.K., K. Iisa, and S.A.Sinquefield, “Sulfur Tolerance of Group VIB-VIII Catalysts for Steam Reforming of Benzene”, presented by S.A. Sinquefield at the Colloquium on Black Liquor, Utah, May, 2003.

Agrawal, P.K., A. Amlani, K. Iisa, and S.A.Sinquefield, “Catalytic Reforming of Tars Formed During Black Liquor/Biomass Gasification”, presented by P.K.Agrawal at the TAPPI Technical Conference, Chicago, October, 2003.

Agrawal, P.K. and L. Xue, “Development of Protocols for the Optimization of Dryer Operation for Improved Energy Efficiency”, presented by P.K. Agrawal at the CCACTI Project Review Meeting, Atlanta, Georgia, January, 2004.

Agrawal, P.K., A. Amlani, K. Iisa, and S.A.Sinquefield, “Catalytic Reforming of Tars Formed During Black Liquor/Biomass Gasification”, presented by P.K.Agrawal at the TAPPI Technical Conference, Atlanta, Georgia, May, 2004.

Agrawal, P.K. and Li Xue, “Development of a Mathematical Model for The Drying of Textile Fabrics”, Final Progress Report Presentation at the CCACTI Annual Review Meeting, Atlanta, Georgia, January, 2005, and Dalton, Georgia, February, 2005.

Agrawal, P.K. and Li Xue, “Development of a Mathematical Model for The Drying of Textile Fabrics”, Presented by P.K. Agrawal at the 3rd International Industrial Simulation Conference, Fraunhofer Institute, Berlin, June, 2005.

Mariefel Valenzuela, Chris W. Jones, and **Pradeep K. Agrawal**, “Aqueous-Phase Reforming of Woody Biomass”, presented by M.Valenzuela at the ACS National Meeting, Atlanta, GA, March, 2006.

Hong, D.Y., **P. K. Agrawal**, and C. W. Jones, “Hydrodeoxygenation of Phenol over Metal-Supported Zeolite Catalysts”, presented by Do-Young Hong at the AIChE Annual Meeting, Nashville, TN, November 2009.

Agrawal, P. K., K. Iisa., S. A. Sinquefield, and S. Lien, “Kinetic Study of Biomass Gasification at High Pressures”, presented by Pradeep K. Agrawal at the AIChE Annual Meeting, Nashville, TN, November 2009.

Morrill, M. R., T. N. Nguyen, **P. K. Agrawal**, C. W. Jones, D. Barton, and D. Ferrari, “Conversion of Synthesis Gas to Ethanol via Potassium Promoted Molybdenum Sulfide Catalyst Supported on Activated Carbon”, presented by Michael Morrill at the Nanotechnology Conference, Egypt, April, 2010.

Iisa, Kristiina, **Agrawal, Pradeep K.**, and Elgqvist, Anna, “Impact of Pressure on Biomass Volatilization and Gasification”, presented by Kristiina Iisa at the TCS Conference, Iowa, September 2010.

Agrawal, P. K., K. Iisa, A. Elgqvist, S. J. Lien, and S. A. Sinquefield, “Kinetic Study of High Pressure Biomass Gasification”, presented by Pradeep K. Agrawal at the AIChE Annual Meeting, Salt Lake City, Utah, November 2010.

Morrill, M. R., T. N. Nguyen, C. W. Jones, **P. K. Agrawal**, D. J. Barton, D. Ferrari, R. J. Davis, and H. Shou, “Mixed Oxide Supports Derived from Layered Metal Hydroxides to Reduce Methanol Selectivity in the Catalytic Synthesis of Higher Alcohols over Potassium-Promoted Molybdenum Sulfide Catalysts”, presented by Michael Morrill at the AIChE Annual Meeting in Minneapolis, MN, October 2011.

Xu, W., S. J. Miller, **P. K. Agrawal**, and C. W. Jones, “Depolymerization and Catalytic Hydrodeoxygenation of Switchgrass Lignin with Formic Acid as a Hydrogen Source”, presented by Weiyin Xu at the AIChE Annual Meeting in Minneapolis, MN, October 2011.

Agrawal, P. K., and K. Iisa, “Effect of Pressure and Heating Rate on Biomass Devolatilization and Gasification”, presented by Pradeep K. Agrawal at the AIChE Annual Meeting in Minneapolis, MN, October 2011.

Newalkar, G. M. (speaker), A. Shitta, **P. K. Agrawal**, K. Iisa, S. Lien, S. A. Sinquefield, and C. Sievers, “Role of Pyrolysis Conditions in the Evolution of Biomass Char Morphology and Gaseous Products”, presented at the IPST Board meeting, Atlanta, GA, April 2012.

Agrawal, Pradeep K. (speaker), “Effect of Pressure and Heating rates on Biomass Pyrolysis and gasification”, at the Workshop on Lignocellulosic Biofuels using Thermochemical Conversion”, held at the Auburn University, Auburn, AL, June 15, 2012.

Newalkar, G. M. (speaker), A. Shitta, S.A. Sinquefield, K. Iisa, C. Sievers, and **P. K. Agrawal**, “Characterization of Products from High Pressure Pyrolysis of Biomass in an Entrained Flow Reactor”, Southeastern Catalysis Society Meeting, Asheville, NC, September 2012.

Newalkar, G. M. (speaker), A. Shitta, S.A. Sinquefield, K. Iisa, C. Sievers, and **P. K. Agrawal**, “Characterization of Products from High Pressure Pyrolysis of Biomass in an Entrained Flow Reactor”, AIChE Annual Meeting, Pittsburgh, PA, November 2012.

Newalkar, G. M. (speaker), A. Shitta, **P. K. Agrawal**, K. Iisa, S. Lien, S. A. Sinquefield, and C. Sievers, “Role of Pyrolysis Conditions in the Evolution of Biomass Char Morphology and Gaseous Products”, presented at the IPST Board meeting, Atlanta, GA, April 2012.

Agrawal P. K. (speaker), K. Iisa, “Development of New gasification Processes for Biomass Residues: Gasification Kinetics at Pressurized Conditions”, May 20, 2013, Washington, D.C., DOE Bioenergy Technology Office (BETO) Project Peer Review.

Xu, W (speaker), S.J. Miller, **P.K. Agrawal**, and C.W. Jones, “Alkylation of Phenol with Propylene Catalyzed by Zeolites”, poster presentation, 23rd North American Catalysis Society Meeting, Louisville, KY, June 2013.

Xu, W. (speaker), S.J. Miller, **P.K. Agrawal**, and C.W. Jones, “Zeolite Catalyzed Alkylation of Phenol with Propylene”, oral presentation, 245th ACS Annual Meeting, New Orleans, LA, April 2013.

Morrill, M. R., N.T. Thao, H. Shou, R.J. Davis, D.G. Barton, D. Ferrari, **P.K. Agrawal**, and C.W. Jones (speaker), “Mixed Oxide Supports Reduce Methanol Selectivity in the Catalytic Synthesis of Higher Alcohols from Syngas over K-Promoted MoS₂ Catalysts”, Catalysis Club of Chicago meeting, Naperville, IL, May 2013.

Morrill, M.J. (speaker), N.T. Thao, H. Shou, R.J. Davis, D.G. Barton, D. Ferrari, **P.K. Agrawal**, and C.W. Jones, “Effect of MO Loading and Metal-Support Interactions on Mixed MgAl Oxide Supported Potassium Promoted Molybdenum Sulfide as a Selective catalyst for Higher Alcohol Synthesis from Syngas”, June 4, 2013, Louisville, KY, North American Catalysis Society Meeting.

Newalkar, G. M., **P.K. Agrawal** (speaker), K. Iisa, C. Sievers, “The Role of Structure and Composition in Gasification Reactivity of Biomass Char”, September 4, 2013, Chicago, IL, tcbiomass2013 Conference.

Agrawal, P. K. (speaker), C. Sievers, J.D. Muzzy, M.A. Syed, P. Kalita, G.M. Newalkar, S.A. Sinquefield, S. Lien, J.P. Henley, D.W. Flick, and B.A. Stears, “Evolution of Morphology of Chars from Pyrolysis of Sugarcane Bagasse”, September 5, 2013, Chicago, IL, tcbiomass2013 Conference.

Newalkar, G. M. (speaker), K. Iisa, C. Sievers, and **P.K. Agrawal**, “Structure-Activity Relationship in Biomass Chars formed in Entrained Flow Reactors”, November 4, 2013, San Francisco, CA, AIChE Annual Meeting.

Syed, M. A. (speaker), **P.K. Agrawal**, C. Sievers, J.D. Muzzy, G.N. Newalkar, S.A. Sinquefield, S. Lien, J.P. Henley, D.W. Flick, and B.A. Stears, “Evolution of the Morphology of Chars from Pyrolysis of Sugarcane Bagasse”, November 4, 2013, San Francisco, CA, AIChE Annual Meeting.

Morrill, M. R., N.T. Thao, H. Shou, R.J. Davis, D.G. Barton, D. Ferrari, **P.K. Agrawal**, and C.W. Jones (speaker), “Effect of Mo Loading and Metal-Support Interactions on Mixed MgAl Oxide Supported, K Promoted MoS₂ in Higher Alcohol Synthesis from Syngas”, Europacat XI, Lyon, France, September 2013.

Newalkar, G., K. Iisa, C. Sievers, and **P. K. Agrawal** (speaker), “Influence of Pyrolysis Variables on Biomass Char Gasification Reactivity”, TCS 2014, Denver, CO, September 2014.

Agrawal, P. K. (speaker), G. Newalkar, C. Sievers, and K. Iisa, “Pressurized Pyrolysis and Gasification of Switchgrass-Lignite Char Blends”, 31st Annual International Pittsburgh Coal Conference, Pittsburgh, PA, October 2014.

Aluri, Sireesha (speaker), **P. K. Agrawal**, J. D. Muzzy, C. Sievers, D.W. Flick, B. A. Stears, and J. P. Henley, “Pyrolysis and Gasification of Municipal Solid Waste”, AIChE Annual Meeting, Atlanta, GA, November 2014.

Syed, M. A. (speaker), G. M. Newalkar, **P. K. Agrawal**, C. Sievers, J. D. Muzzy, S. A. Sinquefield, and D. W. Flick, “Understanding the Gasification Reactivity of Biomass-Derived Chars”, AIChE Annual Meeting, Atlanta, GA, November 2014.

Syed, M.A. (speaker), **P. K. Agrawal**, C. Sievers, J. D. Muzzy, S. Lien, and J. P. Henley, “A Comparative Study on the Pyrolysis and Gasification Behavior of Sugarcane Tops/ Leaves and Sugarcane Bagasse”, AIChE Annual Meeting, Atlanta, GA, November 2014.

Newalkar, G. M. (speaker), K. Iisa, C. Sievers, and **P. K. Agrawal**, “Kinetic Modeling of High Pressure Biomass Gasification using CO₂ and H₂O”, AIChE Annual Meeting, Atlanta, GA, November 2014.

Newalkar G. M. (speaker), K. Iisa, C. Sievers, and **P. K. Agrawal**, “Pressurized Pyrolysis and Gasification of Switchgrass”, AIChE Annual Meeting, Atlanta, GA, November 2014.

Claire, M. T., S. H. Chai, S. Dai, K. A. Unocic, F. M. Alamgir, **P. K. Agrawal**, and C. W. Jones, “Tuning of Higher Alcohol Selectivity and Productivity in CO Hydrogenation Reactions over K/MoS₂ Domains Supported on Mesoporous Activated Carbon and Mixed MgAl Oxide”, AIChE Annual Meeting, Atlanta, GA, November 2014.

Newalkar, G.(speaker), **P. K. Agrawal**, C. Sievers, and K. Iisa, “Pressurized Pyrolysis and Gasification of Biomass Coal Blends”, RBI Executive Conference, Atlanta, GA March 2015

Syed, M. A. (speaker), G. M. Newalkar, **P. K. Agrawal**, C. Sievers, J. D. Muzzy, and D. W. Flick, “Understanding the Gasification Reactivity of Different Biomass Derived Chars”, RBI Executive Conference, Atlanta, GA March 2015

Mahamulkar, S. (speaker), K. Yin, C. W. Jones, **P. K. Agrawal**, R. Davis, H. Shibata, and A. Malek, “In-situ Generation of Radical Coke and Its Effect on Ceria-Catalyzed Coke Oxidation”, North American Catalysis Society Meeting, Pittsburgh, PA June 2015

Taborga Claire, M. (speaker), S.H. Chai, S. Dai, K. A. Unocic, F. M. Alamgir, **P.K. Agrawal**, and C.W. Jones, “Tuning of Higher Alcohol Selectivity and Productivity in CO Hydrogenation Reactions over K/MoS₂ Domains Supported on Mesoporous Activated Carbon and Mixed MgAl Oxide”, North American Catalysis Society Meeting, Pittsburgh, PA June 2015

Agrawal, P. K. (speaker), C. Sievers, and K. Iisa, “Pressurized Pyrolysis and Gasification of Switchgrass-Coal Blends”, DOE-NETL, Pittsburgh, PA June 2015

Agrawal, P. K. (speaker), G. M. Newalkar, K. Iisa, and C. Sievers, “Synergy and Inhibition During co-Gasification of Biomass-Coal Blends”, 2015 C&CBTL Workshop, DOE-NETL, Pittsburgh, PA August 2015

Agrawal, P. K. (speaker), G. M. Newalkar, K. Iisa, and C. Sievers, “Synergy and Inhibition During co-Gasification of Biomass-Coal Blends”, 2015 International Pittsburgh Coal Conference, Pittsburgh, PA October 2015

Aluri, S. (speaker), **P. K. Agrawal**, J. D. Muzzy, C. Sievers, D. W. Flick, B. A. Stears, and J. P. Henley, “Pyrolysis and Gasification of Municipal Solid Waste (MSW)”, AIChE Annual Meeting, Salt Lake City, November 2015

Syed, M. A. (speaker), **P. K. Agrawal**, C. Sievers, J. D. Muzzy, J. P. Henley, and D. W. Flick, “Co-Gasification of Sugarcane Bagasse with Cane Leaves/Tops: Role of Potassium Migration on Char Reactivity”, AIChE Annual Meeting, Salt Lake City, November 2015

Agrawal P. K. (speaker), C. Randall, I. Musin, G. M. Newalkar, K. Iisa, and C. Sievers, “Langmuir-Hinshelwood Kinetic Studies of High-Pressure Switchgrass Char Gasification”, AIChE Annual Meeting, Salt Lake City, November 2015

Tricker, A. (speaker), M. A. Syed, G. M. Newalkar, **P. K. Agrawal**, C. Sievers, and J. D. Muzzy, “Characterization of Biomass Derived Chars using Raman Spectroscopy”, AIChE Annual Meeting, Salt Lake City, November 2015

Mahamulkar, S. (speaker), K. Yin, C. W. Jones, **P. K. Agrawal**, R. Davis, H. Shibata, and A. Malek, “In-situ Generation of Radical Coke by Thermal Aging and Its Effect on Coke-Catalyst Contact”, AIChE Annual Meeting, Salt Lake City, November 2015

Yin, K. (speaker), S. Mahamulkar, H. Shibata, A. Malek, C. W. Jones, **P. K. Agrawal**, and R. J. Davis, “Correlation Between CO Oxidation and Coke Oxidation over Cerium-Zirconium Mixed oxides”, AIChE Annual Meeting, Salt Lake City, November 2015

Taborga Claire, M., M. R. Morrill, J. W. Goh, S-H. Chai, S. Dai, **P. K. Agrawal**, and C. W. Jones, “Insight into Reaction Pathways in CO Hydrogenation Reactions Over K/MoS₂ Supported Catalysts via Alcohol/Olefin co-feed Experiments”, AIChE Annual Meeting, Salt Lake City, November 2015

Mahamulkar, S. (speaker), K. Yin, C.W. Jones, **P. K. Agrawal**, R. J. Davis, H. Shibata, L. Li, and A. Malek, “Catalytic Performance of Thermally Stable Ceria-Alumina Oxides for Coking Resistance and Coke Oxidation”, International Catalysis Congress, Beijing, China July 2016

Sulmonetti, Taylor (speaker), B. Hu, **P.K. Agrawal**, and C. W. Jones, “Ring-Opening of Furfuryl Alcohol Towards 1,5-Pentanediol over Reduced Cu-Co-Al Mixed Metal Oxides”, AIChE Annual Meeting, San Francisco, November 2016

Sulmonetti, Taylor (speaker), B. Hu, **P.K. Agrawal**, and C. W. Jones, “Selective Hydrogenation of Furfuryl Alcohol to 2-Methylfuran over Reduced Cu-Fe-Al Mixed Metal Oxides”, AIChE Annual Meeting, San Francisco, November 2016

M. A. Syed, I. R. Musin (speaker), D.W. Flick, C. Sievers, J.D. Muzzy, and **P. K. Agrawal**, “Inhibition Effect During Catalyzed Biomass Char Gasification in Steam and Carbon Dioxide and Its reversal”, AIChE Annual Meeting, San Francisco, November 2016

P. K. Agrawal (speaker), S. Aluri, J. D. Muzzy, C. Sievers, D.W. Flick, B.A. Stears, and J. P. Henley, “Gasification Reactivity of Model RDF Char and Its Components in Carbon Dioxide and Steam”, AIChE Annual Meeting, San Francisco, November 2016

Sireesha Aluri (speaker), **P. K. Agrawal**, J. D. Muzzy, C. Sievers, D.W. Flick, B. A. Stears, and J. P. Henley, “Challenges in Defining a Model Refuse Derived Fuel

(RDF) and Possible Solutions”, Sixth International Symposium on Energy from Biomass and Waste (ISEBW), Venice, Italy November 2016

Sireesha Aluri (speaker), **P. K. Agrawal**, J. D. Muzzy, C. Sievers, D.W. Flick, B. A. Stears, and J. P. Henley, “Gasification Reactivity of Model RDF Char and Its Components in Carbon Dioxide and Steam”, Sixth International Symposium on Energy from Biomass and Waste (ISEBW), Venice, Italy November 2016

IX. SERVICE

A. PROFESSIONAL CONTRIBUTIONS

I served the AIChE Atlanta professional section for three years (1982-1985) as Secretary, Vice-President, and President successively.

I also served as faculty advisor of the GT AIChE student chapter for 17 years (1988-2005). During this period, the chapter emerged as one of the most active chapters in the nation. It was recognized as one of the outstanding chapters in the nation 14 times. I made workshop presentations at the AIChE Annual meetings to share and educate other chapters and advisors on fund-raising, continuing success, and the educational role it can play in the professional growth of the students. In addition, the Chapter organized two very successful Southern Regional Conferences (1991 and 2004).

B. CAMPUS CONTRIBUTIONS

Campus-wide Committees

Member – Academic Senate and General Faculty Assembly (1993-1996, 2001-2003, 2006-2008)

Member – Georgia Tech Executive Board (2002-2003)

Chair – Dean’s TQM Committee on Structural Co-op Experience (1993-1994)

Member – Faculty Search Committee (School of Textiles and Fiber Engineering) 1997-1998

Member – Institute Undergraduate Curriculum Committee (2007 – 2012)

Chair - Institute Undergraduate Curriculum Committee (2012-2013)

School-wide Committees

Milliken Rising Senior Program (1985 -2004)

I participated in this program since its inception in Summer, 1985. I interacted with summer interns at the manufacturing locations of the Milliken and Company.

Chair –Undergraduate Laboratories (1993-1999)

I was responsible for administering the laboratory operations with about 16 graduate teaching assistants, Laboratory Coordinator, Writing program Specialist, and other faculty members.

ChBE Undergraduate Curriculum Committee

Chair 2005-2006

ex-officio member 2006-present

Member – Students Awards Committee (1996 – present) Chair since 2006

Member – Semester Conversion Committee (1996-1997)

Chair – Safety and Facilities Committee (1988- 1992)

Graduate Admissions – International Students (1994-1998)

I served as a one member committee for international applicants to our graduate program. The responsibilities included screening pre-application forms (~ 500-600/ year), and final reviews of about 200 completed applications to select ~ 10 international students.

Member – School Safety Committee (1988-1992, 1999 – 2004)

Member –School Advisory Committee (2001-2004)

Advisor – ChBE Student Advisory Board (2006-present)

Member - Graduate Admissions Committee (2003-2005)

Member – Assessment Committee (2006-present)

ABET Self Study Report (2006 and 2014)

C. OTHER CONTRIBUTIONS

Consultant - Milliken and Company (1989 –2008), separate from the Milliken Rising Senior Summer Program, involved visits twice a month

Technical Reviewer

I review about 4-6 papers (AIChE Journal, Industrial & Engineering Chemistry, etc) every year. In addition, I also review 2-3 proposals From NSF, ACS-PRF, and DOE every year.

X. GRANTS AND CONTRACTS

Research Grants (since 1990)

1. NASA/McDonnell-Douglas (June, 1990-June, 1992)
Kinetic Study of Bosch Reaction
Amount Funded: \$180,000
2. Air Force Office of Scientific Research (January, 1992-June, 1995)
New Reagents for CVD and CVI of Carbon-Containing Boron & other
Oxidation Inhibitors
(P.J. – W. J. Lackey), Subcontractor – P. K. Agrawal
3. Department of Energy (October, 1977-Sept, 2001)
Catalytic Coal Gasification Using Eutectic Salt Mixtures
(P.I. – Yao Yeboah, Clark Atlanta University)
CO-PI – P. K. Agrawal (\$73,059 Georgia Tech Portion)
4. National Renewable Energy Laboratory (NREL/DOE) (August, 1997-July,
2000)
Characterization and Destruction of Tars Produced During Low Temperature
Black Liquor Gasification
CO-PI with W. J. Frederick (IPST)
Total: \$110,000, (\$84,100 Georgia Tech Portion)
5. OIP – Georgia Tech (January, 1998-June, 1998)
Catalytic Gasification of Tars
CO-PI with K. Iisa (IPST)
Total: \$40,000, (\$20,000 Georgia Tech Portion)
6. Department of Energy (February, 2000-January, 2002)
Stability and Regenerability of Catalysts For the Destruction of Tars from
Biomass and Black Liquor Gasification
Total: \$415, 569 (\$253,069 Georgia Tech portion) (K. Iisa, IPST as Co-PI)
7. Georgia Institute of Technology (Spring, 1999)
Kinetics/Catalysis Laboratory Equipment Grant
Total: \$44,000
8. Hercules, Inc. (Spring, 2000)
Preparation of Mono-dispersed Supported Catalysts
Seed Grant: \$3,000
9. University System of Georgia – Teaching & Learning Grants Program
(September, 1999-June, 2000)

- Development of Critical Thinking Skills of Students in the Planning, Execution and Analyses of Experiments
Amount: \$12,000 (jointly with Melissa Bradley, Writing Program Specialist)
10. Consortium on Competitiveness for the Apparel, Carpet, and Textile Industries (CCAATI) (July, 2002 – June, 2004)
Process Optimization of Dryers and Tenters in the Textile Industry
Amount: \$ 115,000
 11. Institute of Paper Science and Technology, 2002-2003
Chemical Recovery Using Carrier-Supported Titanates
Amount: \$ 20,000 (GT Portion), co-PI with Ingrid Nohlgren
 12. Institute of Paper Science and Technology, 2003-2004
Development of a Two-Stage Process for H₂ Formation from Pine Saw Dust
Amount: \$ 50,000, co-PI with Chris Jones
 13. Institute of Paper Science and Technology, 2004-2006
Design and Synthesis of Catalysts for Converting Woody Biomass into Hydrogen
Amount: \$ 80,000, co-PI with Chris Jones
 14. Chevron Research Corporation, 2007-2010
Catalytic Routes to Fuels from Lignocellulosic Biomass
Amount: \$ 820,000 for 4 years, co-PI with Chris Jones
 15. Dow Chemical Company, 2008-2011
Synthesis of Higher Alcohols from Synthesis Gas over Supported Catalysts
Amount: \$ 950,000 for 3 years, co-PI with Chris Jones, David Sholl, & Bob Davis
 16. U.S. Department of Energy-BETO, 2009-2013
Development of New gasification Processes for Biomass Residue: Gasification Kinetics at Pressurized Conditions
Total Funding Awarded: \$ 996,671
 17. U.S. Department of Energy-NETL, 2010-2014
Development of Kinetics and Mathematical Models for High Pressure Gasification of Lignite-Switchgrass Blends
Principal Investigator(s): P. K. Agrawal (PI/PD), C. Sievers (co-PI), K. Iisa (co-PI)
Amount of Funding Awarded: \$ 1,101,308 (DOE portion) + \$ 463,585 (GT portion)
 18. Dow Chemical Company, November 2011-October 2016
Biomass & Coal Pyrolysis and Gasification
Principal Investigator(s): P. K. Agrawal (PD/PI), C. Sievers (co-PI), J. Muzzy (co-PI)

Total Funding Awarded: \$ 2,313,817

No cost extension till March 2018

19. Institute of Paper Science and Technology, Fall 2011 – Summer 2013
Renewable Nylon 6 Precursors from Lignin fragments by Catalytic Hydrogenation
Principal Investigator(s): C. W. Jones (PI/PD), P. K. Agrawal (co-PI)
Total Funding Awarded: PSE Fellowship (4 years) ~ \$ 80,000

20. Dow Chemical Company, April 2013 – October 2016
Anti-Coking Materials for Steam Crackers
Principal Investigator(s): C. W. Jones (PI/PD), P. K. Agrawal (co-PI), D. Sholl (co-PI)
Total Funding Awarded: \$ 1,200,000

Being renewed for another four years (2017-2020)

Research Grants other than as PI or co-PI (since 1990)

1. Department of Energy (subcontract from the University of Utah), 2002-2005
Investigation of Fluidized Bed Black Liquor Reformer Performance
Amount: \$ 59,964 (as co-PI) PI: Dr. Kevin Whitty