ARVIND VARMA

R. Games Slayter Distinguished Professor and

Davidson School of Chemical Engineering

Purdue University

West Lafayette, IN 47907-2100

Tel: 765-494-8484; Fax: 765-494-0805; Email: avarma@purdue.edu

A. **Personal Information**

Date of Birth: October 13, 1947

Place of Birth: Firozabad, U.P., India - U.S. Naturalized Citizen

Marital Status: Married, two children

B. **Education**

B.S.	(Chem. Eng.), Panjab University, India	1966
M.S.	(Chem. Eng.), University of New Brunswick, Canada	1968
Ph.D.	(Chem. Eng.), University of Minnesota	1972

C. **Professional Experience**

Assistant Professor, University of Minnesota 1972-73

Senior Research Engineer, Union Carbide Corporation 1973-75

Dept. of Chemical Engineering, Univ. of Notre Dame

Assistant Professor 1975-77

Associate Professor 1977-80

Professor 1980-88

Chairman 1982 - 88

Arthur J. Schmitt Professor 1988-2003

Director *(founding),* Center for Molecularly Engineered Materials 2000-2003

School of Chemical Engineering, Purdue University

R. Games Slayter Distinguished Professor 1/2004-present

Head, School of Chemical Engineering 1/2004-8/2012

Jay & Cynthia Ihlenfeld Head of Chemical Engineering 9/2012-7/2016

Visiting Appointments:

Visiting Professor, University of Wisconsin-Madison	Fall 1981
Chevron Visiting Professor, California Institute of Technology	Spring 1982
Visiting Professor, Indian Institute of Technology - Kanpur	Spring 1989
Visiting Chair Professor, University of Cagliari, Italy	Summer 1989, July1992
Visiting Fellow, Princeton University	Spring 1996
Piercy Distinguished Visiting Professor, University of Minnesota	Fall 2001
G.P. Kane Visiting Professor, UICT-Mumbai	January 2007
Golden Jubilee Visiting Fellow, UICT-Mumbai	March 2008
B.D. Tilak Visiting Fellow, ICT-Mumbai	March 2012
Visiting Scholar, University of California – Santa Barbara	1/2017 – 3/2017
Visiting Professor, ETH-Zurich 4/2017 – 6/2017	

D. **Fellowships, Honors and Recognitions**

NSF US-India Exchange Visitor	April 1982
Fellow, American Institute of Chemists	1987
Indo-American Fellowship, Fulbright Scholar Award	1988-89
College of Engineering Outstanding Teacher of the Year Award	1991
Special Presidential Award, Univ. of Notre Dame	1992
R.H. Wilhelm Award, American Institute of Chemical Engineers	1993
Burns Graduate School Award, Univ. of Notre Dame	1997
Ernest W. Thiele Award, AIChE (Chicago section)	1998
Chemical Engineering Lectureship Award, ASEE	2000
Research Achievement Award *(Inaugural),* Univ. of Notre Dame	2001
Honorary Fellow (*Inaugural batch*), Indian Institute of Chem. Engrs	2001
Technology and Innovation Award, *Industry Week*	2005
Honoree, 60th Birthday sessions - I & II, AIChE Annual Meeting	2007
Distinguished Chemical Engineering Alumnus (*Inaugural batch of 3*), Panjab University	2008

Distinguished University Alumnus, Panjab University 2008

Fellow, AIChE 2008

Honoree, Festschrift issue, I&EC Research (Volume 47, No. 23) 2008

Elected Foreign Member, Academy of Engineering, Mexico 2010

Fellow, American Association for the Advancement of Science 2011

Fellow, Industrial & Engineering Chemistry Division, 2011
American Chemical Society

Leadership Award, College of Engineering, Purdue University 2011

Warren K. Lewis Award, AIChE 2013

Sigma Xi Faculty Research Award (Purdue Chapter) 2015

Arden L. Bement Jr. Award for Pure or Applied Science or Engineering, Purdue University 2016

Purdue Innovators Hall of Fame 2017

Giulio Natta Medal in Chemical Engineering 2017

ASEE Benjamin Garver Lamme Award 2018

Special Lectureships:

Plenary Lecture, ISCRE-12, Torino, Italy 1992

Warren McCabe Lecture, North Carolina State University 1992

UOP Invitational Lecture 1994

G. C. A. Schuit Lecture, University of Delaware 1994

Robb Distinguished Lecture, Penn State University 1997

Kuloor Lecture, Indian Institute of Science – Bangalore 1999

Amundson Lectures, University of Guadalajara, Mexico 2001

Piercy Lecture, University of Minnesota 2001

Perkin Elmer Chemcon Distinguished Lecture, 2001
Chennai, India (*Inaugural Speaker*)

Paul C. Wilber Lecture, Rice University 2002

Research Highlight Series Lecture, NSF 2002

ConocoPhillips Lecture, Oklahoma State University 2003

Johansen-Crosby Lecture, Michigan State University 2004

G.P. Kane Lectures, UICT-Mumbai 2007

Golden Jubilee Lecture, UICT-Mumbai 2008

CNR Rao Distinguished Lecture, Chemcon, 2008

Chandigarh, India

Distinguished Chemical Engineering Lecture, Univ. of Utah 2009

Distinguished Engineering Lecture, Univ. of Western Ontario 2010

Induction Lecture, Academy of Engineering, Mexico 2010

Lindsay Lecture, Texas A&M University 2012

B.D. Tilak Lecture, ICT-Mumbai 2012

125 th Anniversary Lecture, Academy of Engineering, Mexico 2013

ChE Academy Lecture, Missouri Univ of Science & Tech 2015

Lyman Handy Lecture, University of Southern California 2017

Dow/Jean B. Cropley Lecture, West Virginia University 2017

Listed in:

American Men and Women of Science, Who's Who in the World,

Who's Who in America, and other biographical listings.

E. **Principal Research Interests**

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

Author of over 320 research publications in these areas.

F. **Professional Society Memberships**

American Institute of Chemical Engineers (AIChE) - Fellow

American Chemical Society (ACS)

American Society for Engineering Education (ASEE)

American Association for the Advancement of Science (AAAS) - Fellow

Sigma Xi

G. **Books**

Mathematical Methods in Chemical Engineering, A. Varma and M. Morbidelli,

690 + xvi pages, Oxford University Press, New York, 1997.

Parametric Sensitivity in Chemical Systems, A. Varma, M. Morbidelli and H. Wu, 342 + xvi pages, Cambridge University Press, Cambridge, U.K., 1999; paperback 2005.

Catalyst Design: Optimal Distribution of Catalyst in Pellets, Reactors and Membranes, M. Morbidelli, A. Gavriilidis and A. Varma, 227 + xii pages, Cambridge University Press, Cambridge, U.K., 2001; paperback 2005.

Edited Books

The Mathematical Understanding of Chemical Engineering Systems: Selected Papers of N. R. Amundson, R. Aris and A. Varma (Editors), Pergamon Press, 829 pages, 1980.

Chemical Reaction and Reactor Engineering, J. J. Carberry and A. Varma (Editors), Marcel Dekker, 1069 pages, 1987.

H. **Editorships**

Series Editor *(founding),*

Cambridge Series in Chemical Engineering

Cambridge University Press 1996 – present

Member of Editorial Board,

Catalysis Reviews - Science and Engineering	1976-1986
International Journal of Self-Propagating High-Temperature Synthesis	1992 – 2006
International Journal of Petroleum Science and Technology	2005-present
Industrial & Engineering Chemistry Research	2012-14

Changing Issues in Chemical Engineering 1989

A. G. Fredrickson, G. R. Gavalas, W. H. Ray and A. Varma (Editors)

Special Issue of *Chemical Engineering Science* (Vol. 44, No. 9)

in honor of Rutherford Aris, Pergamon Press, 334 pages.

ISCRE-18: From Molecular to Product and Process Engineering 2004
A. Varma, B. Subramanian and K. VandenBussche (Editors)
Special Issue of *Chemical Engineering Science* (Vol. 59, No. 22-23; 1033 pages)

Doraiswami Ramkrishna Festschrift 2015
A. Varma and G.D. Yadav (Editors), Industrial & Engineering Chemistry Research, 54 (42), pages 10135-10552.

I. **Professional Activities**

AIChE

Member, National Program Committee on Kinetics, Catalysis and Reaction Engineering (Area 1b)	1978-95
Director *(founding),* Catalysis and Reaction Engineering Division	1995-98
Member, AIChE Awards Committee	1994-99
Program Evaluator for Chemical Engineering Accreditation, AIChE/ABET	1988-98
Member, AIChE Awards Solicitation Committee	2009-11
Member, Program Steering Committee, AIChE Midwest Regional Conference	Jan 2013
Member, International Committee	2012 - 2015
Member, Fellows Council	2014-16
Member, Industry-Academia Alignment Task Force	2014-16
Trustee, AIChE Foundation	2014-present

ISCRE

Member, ISCRE Board	2001 - present
Member, Scientific Committee, ISCRE-15, Newport Beach, CA	Sept. 1998

Member, Scientific Committee, ISCRE-17,
Hong Kong, China Sept. 2002
Chair, ISCRE-18, Chicago, IL 2004
Member, Scientific Committee, ISCRE-19,
Potsdam/Berlin, Germany Sept. 2006
Chair, Amundson Award Committee 2006
Member, Scientific Committee, ISCRE-20,
Kyoto, Japan Sept. 2008
Chair, Amundson Award Committee 2009-
Member, Organizing Committee, ISCRE-21,
Philadelphia, PA Aug. 2010
Member, Scientific Committee, ISCRE-22,
Maastricht, the Netherlands Sept. 2012
Member, Scientific Committee, ISCRE-23, Bangkok, Thailand Sept. 2014

Member, Scientific Committee, ISCRE-25, Florence, Italy May 2018

Other Committee Memberships

Member, Examination Board for Chemical Engineering and Applied
Mathematics, National Council of Engineering Examiners 1976-79
Departmental Representative, CACHE (National Committee
on Computer Aids for Chemical Engineering Education) 1976-80
Member, CACHE Task Force on Large-Scale Systems 1978-80
Member, CACHE Task Force on Personal Computers 1979-81
Member, National Program Committee, I & EC
Division, American Chemical Society 1983-85
Member, Engineering Research Equipment Review
Panel, NSF March 1990
Member, SBIR Proposal Evaluation Panel, NSF Sept. 1993
Member, Career Award Proposal Evaluation Panel, NSF Jan. 1996
Member, Microgravity Combustion Peer Review Panel, NASA June 2000
Member, Chemical Engineering Division Award Committee, ASEE 2001-03

Member, Career Award Proposal Evaluation Panel, NSF Nov. 2001

Diversity Award Committee, Council for Chemical Research 2006-08

Member - 2006, 2007; Chair – 2008

Member, GCEP Proposal Review Panel, Stanford University May 2008

Member, GCEP Proposal Review Panel, Stanford University April 2010

Chair, Awards Committee, I&EC Division, ACS 2012- present

Member, Engineering Research Council Awards Cmte, ASEE 2012- present

Member, Isadore T. Davis Award Committee, ASEE 2012-14

Member, Advisory Committee, Department of Chemical and Biological Engineering, University of Colorado-Boulder 2012-present

Member, Board of Judges for Kirkpatrick Award, 2013
Chemical Engineering magazine

Member, Board of Judges for 2015 Kirkpatrick Award, 2015

Chemical Engineering magazine

Session Chair at Conferences

Chairman, Sessions on Advances in Modeling and Analysis of Chemical Engineering Systems, AIChE Annual Meeting, San Francisco, CA Nov. 1979

Chairman, Session on Fixed-Bed Reactors, ACS National Meeting, Las Vegas, NV Aug. 1980

Chairman, Sessions on Chemical and Catalytic Reactor Modeling, AIChE Annual Meeting, Chicago, IL Nov. 1980

Co-Chairman, Session on New Methods in Mathematical Modeling and Analysis, AIChE Annual Meeting, New Orleans, LA Nov. 1981

Chairman, Session on Mixing and Polymerization, Seventh International Symposium on Chemical Reaction Engineering, Boston, MA Oct. 1982

Chairman, Session on Chemical and Catalytic Reactor Modeling, AIChE Annual Meeting, Los Angeles, CA — Nov. 1982

Chair or Vice-Chair, Session on Chemical Reactor Stability and Dynamics, AIChE Annual Meeting, San Francisco (1984), Chicago (1985), Miami (1986), New York (1987), Washington, DC (1988), Chicago (1990), Los Angeles (1991), Miami (1992)

Chairman, Chemical Engineering Courses Group, NSF Indo-US Seminar on Chemical Engineering Education: Curricula for the Future, Bangalore, India — Jan. 1988

Chairman, Session on Reactor Modeling, Scale - up and Control, Twelfth International Symposium on Chemical Reaction Engineering, Torino, Italy — June 1992

Chair, Murphree Award Symposium, ACS National Meeting, Denver, CO — April 1993

Co-Chair, Session on Synthesis of New Materials, International Symposium on Chemical Reaction Engineering-13, Baltimore, MD — Sept. 1994

Chair, Session on Future Directions in Chemical Reaction Engineering, AIChE Annual Meeting, San Francisco, CA — Nov. 1994

Chair, Session on Reactor Operation with Flow Reversal, 2nd International Conference on Unsteady-State Processes in Catalysis, St. Louis, MO — Sept. 1995

Chair, Session on SHS Methods: New Variations and New Problems, 3rd International Symposium on Self-Propagating High-Temperature Synthesis, Wuhan, China — Oct. 1995

Co-Chair, Session on Catalyst Design, AIChE Annual Meeting, Miami Beach, FL — Nov. 1995

Chair, Session on Future Directions in Reaction Engineering Research: Papers in Honor of Rutherford Aris, AIChE Annual Meeting, Chicago, IL — Nov. 1996

Chair, Session on Fundamentals of SHS, 4th International — Oct. 1997

Symposium on Self-Propagating High-Temperature Synthesis, Toledo, Spain		
Chair, Session on "Dynamic Processes on Catalyst Surfaces," Third International Conference on Unsteady State Processes in Catalysis, St. Petersburg, Russia	July	1998
Chair, Session on "Catalytic Reactors," International Symposium on Chemical Reaction Engineering-15, Newport Beach, CA	Sep.	1998
Chair, Session on Future Directions in Reaction Engineering Research, AIChE Annual Meeting, Miami Beach, FL	Nov.	1998
Chair, Session on Combustion Mechanisms, 5th International Symposium on Self-Propagating High-Temperature Synthesis, Moscow, Russia	Aug.	1999
Chair, Round Table on SHS in Chemical Engineering, 5th International Symposium on Self-Propagating High-Temperature Synthesis, Moscow, Russia	Aug.	1999
Chair, Session on Membrane Reactors, AIChE Annual Meeting, Dallas, TX	Nov.	1999
Chair, Sessions on Inorganic Membranes for Reaction and Separation, North American Membrane Society Meeting, Boulder, CO	May	2000
Chair, Session on Metallic Membranes, International Conference on Inorganic Membranes, Montpellier, France	June	2000
Chair, Session on Conversion Enhancement, International Conference on Catalysis in Membrane Reactors, Zaragoza, Spain	July	2000
Chair, Session on Reactor Dynamics and Control, International Symposium on Chemical Reaction Engineering-16, Cracow, Poland	Sep.	2000
Chair, Session on Future Directions in Reaction Engineering Research, AIChE Annual Meeting, Los Angeles, CA	Nov.	2000
Chair, Plenary Session, International Symposium on Chemical	Aug.	2002

Reaction Engineering-17, Hong Kong

Chair, Session on Future Directions in Reaction Engineering Research, AIChE Annual Meeting, Indianapolis, IN — Nov. 2002

Chair, Session on Novel Reactors and Process Developments, International Symposium on Chemical Reaction Engineering-19, Potsdam/Berlin — Sep. 2006

Chair, Sessions (2) in honor of Neal Amundson's 90th Birthday, AIChE Annual Meeting, San Francisco, CA — Nov. 2006

Chair, Sessions (2) in honor of Wilhelm Award Recipient, AIChE Annual Meeting, San Francisco, CA — Nov. 2006

Chair, Session on Materials Processing, International Symposium on Chemical Reaction Engineering-20, Kyoto, Japan — Sep. 2008

Chair, Plenary Session – 1, International Symposium on Chemical Reaction Engineering-21, Philadelphia, PA — June 2010

Chair, Session in honor of Roger Schmitz' 75th Birthday, AIChE Annual Meeting, Salt Lake City, UT — Nov. 2010

Chair, Session on Reaction Path Analysis & Reaction Kinetics, International Symposium on Chemical Reaction Engineering-22, Maastricht, The Netherlands — Sep. 2012

Chair, Panel Discussion on "The Next Steps," U.S.-India Symposium on Energy, Environment and Sustainability, AIChE Annual Meeting, Pittsburgh, PA — Oct. 2012

Other Conference Related Activities

Invited Reporter for Reactors, First International Conference on Foundations of Computer-Aided Process Design, Henniker, NH — July 1980

Academic Co-Reporter, Workshop on Catalysis, Council for Chemical Research Meeting, Houston, TX — Sept. 1982

Plenary Lecturer, International Chemical Reaction Engineering Conference, Pune, India — Jan. 1984

Invited Lecture, International Chemical Reaction Engineering Conference-2, Pune, India — April 1987

Plenary Lecturer, International Conference on Advances in Chemical Engineering, Kanpur, India — Jan. 1989

Member, Program and Publication Committee, Second International Symposium on Self-Propagating High Temperature Synthesis, Honolulu, HI — Nov. 1993

Member of Organizing Committee, 2nd International Conference on Unsteady-State Processes in Catalysis, St. Louis, MO — Sept. 1995

Member, Program and Publication Committee, Third International Symposium on Self-Propagating High-Temperature Synthesis, Wuhan, China — Oct. 1995

Invited Lecture, International Conference on Advances in Chemical Engineering, Madras, India — Dec. 1996

Member, International Advisory Committee, Fourth International Symposium on Self-Propagating High-Temperature Synthesis, Toledo, Spain — Oct. 1997

Member of Organizing Committee, 3rd International Conference on Unsteady-State Processes in Catalysis, St. Petersburg, Russia — July 1999

Member, International Advisory Committee, Fifth International Symposium on Self-Propagating High-Temperature Synthesis, Moscow, Russia — Aug. 1999

Member, International Advisory Committee, Sixth International Symposium on Self-Propagating High-Temperature Synthesis, Haifa, Israel — Oct. 2001

Member, Scientific Committee, International Conference on Catalysis in Membrane Reactors, Dalian, China — June 2002

Member of Organizing Committee, 4th International

Conference on Unsteady-State Processes in Catalysis,
Montreal, Canada Oct. 2003

Member of Organizing Committee, 5th International
Conference on Unsteady-State Processes in Catalysis,
Osaka, Japan Nov. 2006

Chair, International Advisory Board, Energy Center April 2007
Hydrogen Initiative Symposium – 2, Purdue University

Member, Scientific Advisory Committee, Sino-US
Conference of Chemical Engineering, Beijing, China October 2009

Member, International Advisory Committee, 9th World Congress
of Chemical Engineering, Seoul, Korea August 2013

Member, International Advisory Committee, October 2013
International Symposium on Self-Propagating
High-Temperature Synthesis - 13, South Padre Island, TX

Co-Organizer, Indo-US Chemical Engineering Conference Dec. 2013
on Energy, Environment and Sustainability, Mumbai, India

Member, International Advisory Committee, Chemcon-2013, Dec. 2013
Mumbai, India

Member, Advisory Committee, Chemcon-2014, Dec. 2014
Chandigarh, India

Consulting

Ford Motor Company	1978 - 83
Olin Chemicals	1990 - 91
Union Carbide Corporation	1990 - 98
International Specialty Products (Member of Science Advisory Board)	1992 - 97
B/E Aerospace	1999- 2002
Alexza Corporation	2006-2007
Heritage Research Group	2008
Kleiner Perkins Caufield & Byers	2008

Sriya Green Materials 2009-2010

BASF 2013-14

Air Liquide – Member, Science Advisory Board 2015-present

J. **Doctoral Dissertations Directed**

Completed

1. * C. J. Pereira, "Modeling of the Catalytic Converter for Automotive Exhaust Gas, "University of Notre Dame, August 1978; 209 + xii pages.
2. * A. L. DeVera, "Some Problems Concerning Transport in Random Heterogeneous Media and Chemically Reacting Systems," University of Notre Dame, January 1979; 339 + xii pages.
3. S. C. Paspek, "Experimental and Theoretical Investigation of Ethylene Oxidation in a Fixed-Bed Reactor," University of Notre Dame, August 1979; 135 + ix pages.
4. J. B. Wang, "Problems Involving Diffusion and Reaction in Porous Catalyst Pellets, and the Modeling of Catalytic Converter for Automotive Exhaust System," University of Notre Dame, February 1980; 125 + ix pages.
5. D. T.-J. Huang, "Steady State and Dynamic Behavior of Gas-Liquid Reactors," University of Notre Dame, June 1980; 173 + xii pages.
6. * V. Ravichandran, "Characterization, Sintering and Transient Reaction Kinetics for Model Three-Way Catalysts," University of Notre Dame, September 1981; 89 + vii pages.
7. N. Jothi, "Reaction Kinetics for Carbon Monoxide Oxidation on a Commercial Three-Way Catalyst," University of Notre Dame, October 1982; 151 + viii pages.
8. A. Shaikh, "Studies on the Steady State Behavior of Gas-Liquid Reactors," University of Notre Dame, December 1983; 172 + xii pages.
9. B. Subramaniam, "Reactions of CO, NO, O_2 and H_2O on Pt/γAl_2O_3 and Commercial Three-Way Catalysts," University of Notre Dame, February 1984, 190 + ix pages.
10. S. Dhalewadikar, "Ethylene Oxidation on Supported Platinum Catalyst in a Non-Adiabatic Fixed-Bed Reactor: Experiments and Model," University of Notre Dame, July 1984, 200 + ix pages.
11. M. Kosanovich, "Reactions of Propylene, Nitric Oxide, and Oxygen on Platinum/γ-Al_2O_3,Iridium/γ-Al_2O_3 and Platinum-Iridium/BaO-Al_2O_3 Catalysts," University of Notre Dame, August 1986, 290 + xviii pages.
12. R. Chemburkar, "Optimal Catalyst Activity Profiles in Pellets: Single Pellet Theory and Experiments," University of Notre Dame, December 1986, 104 + x pages.
13. M. Morbidelli, "Parametric Sensitivity and Runaway in Chemically Reacting Systems," University of Notre Dame, April 1987, 248 + xi pages.
14. R. Herrera, "Effect of Gold in the Oxidation of Ethylene over α-Alumina Supported Silver-Gold Catalysts," University of Notre Dame, July 1987, 203 + xiv pages.

15. C. Lee, "Theoretical and Experimental Studies of Fixed-Bed Reactors with Non-Uniformly Active Catalyst Pellets," University of Notre Dame, September 1987, 157 + xi pages.

16. E. Bauman, "Parametric Sensitivity in Non-Adiabatic Catalytic Fixed-Bed Reactors: Theory and Experiments," University of Notre Dame, September 1988, 148 + x pages.

17. D. Price, "Preparation of Pt/γ-Al_2O_3 Pellets with an Internal Step-Distribution of Catalyst: Experiments and Theory," University of Notre Dame, October 1988, 141+ x pages.

18. R. Pigeon, "Chemical Reaction Engineering Considerations in the Synthesis of Silicon Nitride," University of Notre Dame, March 1992, 235 + xv pages.

19. J. -P. Lebrat, "Mechanistic and Processing Studies Related to Combustion Synthesis of Advanced Materials," University of Notre Dame, December 1992, 118 + xiii pages.

20. A. Gavriilidis, "Optimal Distribution of Silver Catalyst in Pellets for Epoxidation of Ethylene," University of Notre Dame, July 1993, 218 + xvi pages.

21.* D. Chatzopoulos, "Experimental and Modeling Studies on Membrane-Aerated Granular Activated Carbon-Sequencing Batch Biofilm Reactors," University of Notre Dame, September 1994, 309 + xxiii pages.

22.* U. Stafford, "Photocatalytic Oxidation of a Model Halogenated Aromatic Compound: A Mechanistic Study," University of Notre Dame, October 1994, 223 + xvii pages.

23. C. Kachelmyer, "Mechanistic and Product Structure Formation Studies in the Combustion Synthesis of Advanced Materials," University of Notre Dame, April 1996, 151 + xv pages.

24.* M. Maalmi, "Reaction-Bonded Silicon Nitride Synthesis: Modeling, Analysis and Experiments," University of Notre Dame, August 1996, 200 + xix pages.

25.* R. Wu, "Enhancing Performance of Three-Phase Packed-Bed Catalytic Reactors by Pulsing-Flow Regime: Modeling and Experimental Study," University of Notre Dame, June 1997, 183 + xiii pages.

26. J. Szegner, "Effects of Nonuniform Catalyst Distribution on Inorganic Membrane Reactor Performance: Experiments and Theory," University of Notre Dame, June 1997, 206 + xix pages.

27. S. Hwang, "Microstructure of Wave Propagation during Combustion Synthesis of Advanced Materials: Experiments and Theory," University of Notre Dame, November 1997, 158 + x pages.

28. A. Pelekh, "Combustion Synthesis of Advanced Materials: Studies of the Influence of Gravity and Reaction Kinetics," University of Notre Dame, June 1999, 115 + ix pages.

29. R. Souleimanova, "Palladium-Composite Membranes: Synthesis, Characteristics and Properties," University of Notre Dame, September 2000, 115 + ix pages.

30. L. Thiers, "Mechanistic Studies Involving Kinetics of Rapid High-Temperature Reactionsfor Materials Synthesis," University of Notre Dame, April 2002, 116 + xv pages.

31.* B. Wilhite, "Pulsing-Flow Regime in Trickle-Bed Reactors: Hydrodynamics and Reactor Design," University of Notre Dame, September 2002, 140 + xiii pages.

32. C. Lau, "The Effects of Gravity on Combustion Synthesis of Advanced Materials," University of Notre Dame, October 2002, 151 + xiv pages.

33. V. Diakov, "Methanol Oxidative Dehydrogenation in a Catalytic Packed-Bed Membrane Reactor: Experiments and Model," University of Notre Dame, October 2002, 89 +xi pages.

34.* R. Huang, "Flow Patterns and their Influence on Trickle-Bed Reactors: Experiments and Theory," University of Notre Dame, October 2002, 92 + xv pages.

35. K. Deshpande, "Nanoscale Advanced Materials Using Aqueous Combustion Synthesis," University of Notre Dame, January 2005, 97 + xi pages.

36. C. Norfolk, "Processing of Mesocarbon Microbeads to High-Performance Materials for Friction Applications," University of Notre Dame, March 2005, 96 + xvi pages.

37. P. Erri, "Solution Combustion Synthesis for Catalytic and Power Generation

Applications," Purdue University, March 2007, 111 + xiv pages.

38. T. Andrzejak, "Experimental Studies on the Ignition of Single Ni/Al, Fe/Al, and Ti Particles," Purdue University, September 2007, 146 + xvi pages.

39. M. Diwan, "Hydrogen Generation for Fuel Cell Applications," Purdue University, August 2009, 111 + xviii pages.

40. W. Hu, "Catalytic Oxidation of Glycerol to High-Value Chemical Dihydroxyacetone Over Pt-Bi/C Catalyst," Purdue University, May 2011, 89 + xix pages.

41. A. Al-Kukhun, "Hydrogen Generation for Fuel Cell Vehicle Applications," Purdue University, May 2012, 198 + xviii pages.

42. R. Ghose, "Oxidative Coupling of Methane using Catalysts Synthesized by Solution

Combustion Method,' Purdue University, September 2013, 123 + xix pages.

43. D. Gao, "Catalytic Hydrodeoxygenation of Guaiacol over Noble Metal Catalysts," Purdue University, September 2014, 109 + xvi pages.

44.* Y. Xiao, "Heterogeneous Catalysis for Biodiesel Production and Utilization of its Byproduct Crude Glycerol by Selective Oxidation,' Southeast University (China), November 2014, 137 + xii pages.

45. G. Honda, "The Hydrodynamics of Trickle Bed Reactors," Purdue University, August 2015, 102 + xi pages.

46. S. B. Lee, "Multiphase Reaction Studies in Stirred Tank and Fixed Bed Reactors," Purdue University, December 2015, 198 + xxv pages.

47. Ryan Adams, 2019

48. Wooram Kang, 2019

Note: * indicates joint supervision.

K. **Invited Lectures (Graduate Research Seminars)**

	Institution	*Date*	
1.	University of Michigan, Ann Arbor, MI	October	1978
2.	Ford Motor Company, Dearborn, MI	March	1979
3.	Northwestern University, Evanston, IL	April	1979
4.	University of Minnesota, Minneapolis, MN	May	1979
5.	Purdue University, West Lafayette, IN	September	1979
6.	Illinois Institute of Technology, Chicago, IL	October	1979
7.	Universidad Autonoma Metropolitana-Iztapalapa, Mexico City	January	1980
8.	University of Houston, Houston, TX	February	1980
9.	University of Florida, Gainesville, FL	May	1980
	- Also a series of ten special lectures in stability theory and applications to reactor design	October	1980
10.	Iowa State University, Ames, IA	February	1981
11.	University of Illinois, Urbana, IL	September	1981
12.	University of Wisconsin, Madison, WI	October	1981
13.	University of California, Davis, CA	January	1982
14.	University of California, Berkeley, CA	February	1982
15.	University of California, Santa Barbara, CA	February	1982
16.	University of California, San Diego, CA	February	1982
17.	Stanford University, Stanford, CA	March	1982
18.	National Chemical Laboratory, Pune, India	April	1982
19.	University of Bombay, Bombay, India	April	1982
20.	Regional Research Laboratory, Hyderabad, India	April	1982
21.	Indian Institute of Science, Bangalore, India	April	1982
22.	Engineers India Limited, Delhi, India	April	1982
23.	Politecnico di Milano, Milano, Italy	May	1982
24.	California Institute of Technology, Pasadena, CA	May	1982
25.	University of Southern California, Los Angeles, CA	May	1982
26.	Carnegie-Mellon University, Pittsburgh, PA	November	1982

27.	University of Virginia, Charlottesville, VA	October	1983
28.	Indian Institute of Technology, Kanpur, India	January	1984
29.	Miles Laboratories, Elkhart, IN	August	1984
30.	University of Rochester, Rochester, NY	December	1985
31.	Penn State University, University Park, PA	March	1986
32.	Exxon Research and Engineering, Florham Park, NJ	August	1986
33.	University of Texas, Austin, TX	November	1986
34.	Indian Institute of Technology, Kanpur, India	April	1987
35.	University of Virginia, Charlottesville, VA	September	1987
36.	Wayne State University, Detroit, MI	October	1987
37.	University of Pennsylvania, Philadelphia, PA	February	1988
38.	Union Carbide Corporation, South Charleston, WV	May	1988
39.	Allied Signal Research Center, Des Plaines, IL	May	1988
40.	University of Tubingen, Tubingen, West Germany	September	1988
41.	Indian Institute of Technology, Kanpur, India	April	1989
42.	Harcourt Butler Technological Institute, Kanpur, India	April	1989
43.	Indian Institute of Technology, Bombay, India	May	1989
44.	Indian Petrochemicals Corporation, Baroda, India	May	1989
45.	University of Bombay, Bombay, India	May	1989
46.	National Chemical Laboratory, Pune, India	May	1989
47.	Universita di Cagliari, Cagliari, Italy	June	1989
48.	Universita di Roma, Rome, Italy	June	1989
49.	Universita di Pisa, Pisa, Italy	June	1989
50.	Universita di Bologna, Bologna, Italy	June	1989
51.	Universita di Padova, Padova, Italy	June	1989
52.	Politecnico di Milano, Milan, Italy	June	1989
53.	Olin Chemicals, Charleston, TN	February	1990
54.	University of California, Davis, CA	February	1990
55.	Union Carbide Corporation, South Charleston, WV	April	1990
56.	Argonne National Laboratory, Argonne, IL	July	1990
57.	Texaco Research Center, Beacon, NY	October	1990
58.	Washington University, St. Louis, MO	March	1991

59.	Shell Development Company, Houston, TX	June	1991
60.	Union Carbide Corporation, South Charleston, WV	July	1991
61.	University of Wisconsin, Madison, WI	January	1992
62.	International Specialty Products, Wayne, NJ	June	1992
63.	Universita di Cagliari, Cagliari, Italy	July	1992
64.	Reilly Industries, Indianapolis, IN	January	1993
65.	Northwestern University, Evanston, IL (Depts. of Chem. Engg. & Appl. Math.)	February	1993
66.	McGill University, Montreal, Canada	March	1993
67.	Monsanto Company, St. Louis, MO	March	1993
68.	EPA Research Laboratory, Cincinnati, OH	May	1993
69.	University of Southern Mississippi, Hattiesburg, MS (Dept. of Chemistry and Biochemistry)	October	1993
70.	Arco Chemical Company, Newtown Square, PA	December	1993
71.	University of Kansas, Lawrence, KS	October	1994
72.	Chevron Research & Technology Company, Richmond CA	December	1994
73.	University of Naples, Naples, Italy	February	1995
74.	University of Akron, Akron, OH	March	1995
75.	Alfred University, Alfred, NY (School of Ceramic Engineering & Sciences)	April	1995
76.	Princeton University, Princeton, NJ (Dept. of Mechanical & Aerospace Engg.)	February	1996
77.	Exxon Research & Engineering Company, Annandale, NJ	March	1996
78.	Iowa State University, Ames, IA	March	1996
79.	Princeton University, Princeton, NJ	April	1996
80.	University of Minnesota, Minneapolis, MN	April	1996
81.	Lummus Company, Bloomfield, NJ	April	1996
82.	City College of the City University of New York, New York, NY	April	1996
83.	University of Houston, Houston, TX	April	1996
84.	Engelhard Corporation, Iselin, NJ	May	1996
85.	Union Carbide Corporation, South Charleston, WV	August	1996

86.	Du Pont Central Research, Wilmington, DE	October	1996
87.	Institute of Catalysis, Madrid, Spain	October	1997
88.	ETH - Zurich, Switzerland	March	1998
89.	Universita di Cagliari, Cagliari, Italy	July	1998
90.	Hong Kong Univ. of Science & Technology, Hong Kong	June	1999
91.	National University of Singapore, Singapore	June	1999
92.	Indian Institute of Technology, Delhi, India	June	1999
93.	Eindhoven University of Technology, The Netherlands	August	1999
94.	Rutgers University, Piscataway, NJ	October	1999
95.	Cornell University, Ithaca, NY	January	2000
96.	DSM Research, Geleen, The Netherlands	March	2000
97.	CPE-Lyon, Lyon, France	June	2000
98.	University of Texas, Austin, TX (Institute for Advanced Technology)	November	2000
99.	University of Delaware, Newark, DE	December	2000
100.	Shell Chemicals Company, Houston, TX	January	2001
101.	University of California, Berkeley, CA	February	2001
102.	Worcester Polytechnic Institute, Worcester, MA	March	2001
103.	University of Minnesota, Minneapolis, MN	September	2001
104.	North Carolina State University, Raleigh, NC	October	2001
105.	University of Michigan, Ann Arbor, MI	October	2001
106.	Lehigh University, Bethlehem, PA	April	2002
107.	General Motors R&D Center, Warren, MI	February	2003
108.	University of Arizona, Tucson, AZ	March	2003
109.	ExxonMobil Research & Engineering Co., Annandale, NJ	March	2003
110.	Purdue University, West Lafayette, IN	May	2003
111.	University of California, Los Angeles, CA	February	2005
112.	CPE-Lyon, Lyon, France	June	2005
113.	Politecnico di Milano, Milano, Italy	June	2005
114.	Drexel University, Philadelphia, PA	May	2006
115.	Rose-Hulman Inst of Technology, Terre Haute, IN	October	2006
116.	Purdue University, School of Mechanical Engineering	December	2006
117.	Univ. Institute of Chemical Technology (UICT), Mumbai	January	2007

118. Texas Tech University, Lubbock, TX March 2007
119. University of Houston, Houston, TX March 2007
120. University of Pittsburgh, Pittsburgh, PA September 2007
121. Carnegie-Mellon University, Pittsburgh, PA September 2007
122. Reliance Industries Ltd, Mumbai, India March 2008
123. New Jersey Institute of Technology, Newark, NJ March 2008
124. Indian Institute of Technology – Bombay, Mumbai, India January 2009
125. Tata Chemicals Innovation Center, Pune, India January 2009
126. MATRIC, Inc, South Charleston, WV August 2009
127. University of Texas, Austin, TX September 2009
128. Lamar University, Beaumont, TX April 2010
129. Columbia University, New York, NY October 2010
130. Georgia Institute of Technology, Atlanta, GA December 2010
131. Vanderbilt University, Nashville, TN February 2011
132. Tsinghua University, Beijing, China October 2011
133. Universidad de los Andes, Bogota, Colombia November 2011
134. Illinois Institute of Technology, Chicago, IL January 2012
135. Texas A&M University, College Station, TX February 2012
136. Cornell University, Ithaca, NY April 2012
137. ExxonMobil Research & Engineering Co., Annandale, NJ January 2013
138. The Dow Chemical Company, Freeport, TX July 2013
139. Korea Institute of Science & Technology, Seoul, Korea August 2013
140. Korea University (50 th anniversary symposium), Seoul, Korea August 2013
141. Kazan National Research Technical Univ., Kazan, Russia September 2013
142. National Chemical Laboratory, Pune, India January 2014
143. Northwestern University, Evanston, IL March 2014
144. UOP, Des Plaines, IL March 2014
145. The Dow Chemical Company, Midland, MI June 2014
146. East China University of Science and Technology, Shanghai October 2015
147. University of California, Los Angeles, CA March 2017
148. University of California, Santa Barbara, CA March 2017

L. **Papers Presented at Conferences** - over 330 in all, at various professional society meetings (separate list available).

M. **Selected List of Services to the University**

I. PURDUE UNIVERSITY

Member, College of Engineering Leadership Team	2004-present
Member, Engineering Area Promotions Committee	2004-present
Member, College of Engineering Research Advisory Committee	2004-05
Member, Head Search Committee, Dept. of Chemistry	2004
Member, Director Search Committee, Birck Nanotechnology Center	2005-06
College of Engineering Financial Affairs Team	
Member	2005-08
Chair	2006-08
Chair, Internal Assessment Committee to review the	2005-06
College of Engineering Graduate Programs	
Member, Engineering Dean Search Committee	2006
Distinguished Professor Committee, College of Science	March 2006
Distinguished Professor Committee, College of Engineering	Oct 2006
Chair, International Advisory Board, Energy Center	2007
Hydrogen Symposium – 2	
Member, H. C. Brown Award Committee, Energy Center	2009
Hydrogen Symposium – 3	
Purdue Engineering Strategic Plan,	2009
ELT Co-Champion, Team 2 – The Research Enterprise	
Member, CoE Heads' On-Boarding program	2009
Mentoring; Research Enterprise and SPS Services	
Chair, Distinguished Professor Committee, College of Engineering	Sep 2009
College of Engineering ELT Committees	
Member, ELT Task Force on Ways to Encourage Ph.D.	Oct 2008
Graduates to Seek Faculty Careers	
Member, ELT Strategic Topic: Growth of Research	Nov 2008
Member, ELT *ad hoc* Cmte for Tracking Faculty Awards	Jan 2010
Member, ELT *ad hoc* Cmte on Committees	July 2010

Lead, ELT *ad hoc* Cmte for Ethics/Academic Honor Code	July 2010
Member, CoE Budget Contingency Planning Team	Fall 2010, Fall 2011
Chair, Civil Engineering Head Search Committee	2011-12

II. UNIVERSITY OF NOTRE DAME

a. *University*

Faculty Senate	1978-81
Committee on Admissions, Sigma Xi	1978-83
Committee on Research & Sponsored Programs	1980-83,1989-92, 1992-95
Committee on Final Examinations Policy (Ad Hoc)	1983-84
Committee to Select the Grace-Rupley Chairholder in Chemistry (Ad Hoc)	1986-88
Graduate Council	1987-90, 1995-98
Chairman, Internal Review Team, Dept. of Physics Review of Graduate Program	1988
Committee on Doctoral Student Teaching (Ad Hoc)	1989-90
Budget Priorities Committee	1989-90
Committee for Policy on Racial Harassment (Ad Hoc)	1990
Chairman, Task Force on Research Systems	1990
Member of Internal Review Team, Kellogg Institute for International Studies and Institute for International Peace Studies	1991
Academic Council Member of Executive Committee (1991-92, 1992-93, 1993-94)	1991-94
Member, Task Force on Cultural Diversity	1991-92
Member, Provost Review Committee	1992
Member, Search Committee for Director, Institute for International Peace Studies	1992
Academic and Faculty Affairs Committee of the Board of Trustees	1994-97
Member, Burns Award Committee	1998

Member, Task Force on Strategic Directions in Science and Engineering	1999
Director (founding), Center for Molecularly Engineered Materials	2000-03
Member, Research Achievement Award Committee	2002, 2003

b. *College*

Systems Matrix Group	1975-81
Engineering Computer Committee	1975-81
Applied Mathematics Committee	1977-81
Executive Committee	1982-88
College Council	1982-88, 1990-93
Committee for Evaluation of Chaired Professorship Candidates	1984, 87
Member, Dean Search Committee	1987
Member of Executive Committee, Center for Bioengineering and Pollution Control	1988-96
Organizer of Sesquicentennial Year Symposium: Frontiers of Engineering Research	Spring 1992
Committee to Select Teacher of the Year (Chair - 1994)	1993, 1994
Member of Executive Committee, Center for Catalysis and Reaction Engineering	1993-99
Co-Chair, Committee on the Role of Materials Science and Engineering in the College of Engineering	1995-96
Coordinator, Center for Materials Research	1997-98
Co-Chair, Session on Critical Technologies of the 21st Century, Advisory Council Meeting	Sep. 1998
Chair, Committee on Materials Technologies	1998-99

c. *Department*

Committee for Appointments and Promotions (elected)	1977-2003

Graduate Recruiting	1977-79, 1982-86
	1989-91, 1995-96
Standards	1975-79
Graduate and Undergraduate Curriculum	1975-79
Director of Graduate Studies	1977-79, 1982-86
Graduate Studies and Research	1980-86
Chairman Search Committee	1981-82
Dept. Chairman	1982-88
Honors and Awards	1996-2003

LIST OF PUBLICATIONS

Arvind Varma

1. "Spontaneous Ignition of High Voidage Cellulosic Fuels," A. Varma and F. R. Steward, Journal of Fire and Flammability, 1, 154-165 (1970).

2. "Global Asymptotic Stability in Distributed Parameter Systems - Comparison Function Approach," A. Varma and N. R. Amundson, Chemical Engineering Science, 27, 907-918 (1972).

3. "Some Problems Concerning the Non-Adiabatic Tubular Reactor - Qualitative Behavior, A Priori Bounds, Preliminary Uniqueness and Stability Considerations," A. Varma and N. R. Amundson, Canadian Journal of Chemical Engineering, 50, 470-485 (1972).

4. "Maximal and Minimal Solutions, Effectiveness Factors for Chemical Reaction in Porous Catalysts," A. Varma and N. R. Amundson, Chemical Engineering Science, 28, 91-104 (1973).

5. "Some Observations on Uniqueness and Multiplicity of Steady States in Non-Adiabatic Chemically Reacting Systems," A. Varma and N. R. Amundson, Canadian Journal of Chemical Engineering, 51, 206-226 (1973).

6. "Local Stability of Tubular Reactors," A. Varma and N. R. Amundson, AIChE Journal, 19, 395-398 (1973).

7. "The Non-Adiabatic Tubular Reactor Stability Considerations," A. Varma and N. R. Amundson, Canadian Journal of Chemical Engineering, 51, 459-467 (1973).

8. "Some Remarks Concerning Reversible Chemical Reactions in Porous Catalysts," A. Varma, Chemical Engineering Science, 29, 1340-1343 (1974).

9. "Some General Considerations of Reversible Chemical Reactions in Batch and Tubular Reactors," A. Varma and N. R. Amundson, Canadian Journal of Chemical Engineering, 52, 580-590 (1974).

10. "Computational Methods for the Tubular Chemical Reactor," A. Varma, C. Georgakis, N. R. Amundson and R. Aris, Computer Methods in Applied Mechanics and Engineering, 8, 319-330 (1976).

11. "Stirred Pots and Empty Tubes," A. Varma and R. Aris, Chapter 2 in *Chemical Reactor Theory - A. Review,* L. Lapidus and N. R. Amundson (Editors), pgs 79-155, Prentice-Hall (1977).

12. "Bounds on the Concentration and Temperature in a Tubular Reactor," A. Varma, Canadian Journal of Chemical Engineering, 55, 629-632 (1977).

13. "Effectiveness Factors for the Case of Mildly Concentration-Dependent Diffusion Coefficients," C. J. Pereira and A. Varma, Chemical Engineering Science, 33, 396-399 (1978).

14. "Some Comments on the Upward Spiral," A. Varma, AIChE Journal, 24, 158-159 (1978).

15. "Catalytic Effectiveness and Yield: The Case Involving Finite External and Internal Area," P. Varghese, A. Varma and J. J. Carberry, Industrial and Engineering Chemistry Fundamentals, 17, 195-199 (1978).

16. "Effectiveness Factors for Pellets with Step-Distribution of Catalyst," J. B. Wang and A. Varma, Chemical Engineering Science, 33, 1549-1552 (1978).

17. "Uniqueness Criteria of the Steady State in Automotive Catalysis," C. J. Pereira and A. Varma, Chemical Engineering Science, 33, 1645-1657 (1978).

18. "Yield Optimization in Complex Reaction Networks," A. L. DeVera and A. Varma, Modeling and Simulation, 9, 1425-1431 (1978).

19. "Uniqueness Criteria for First Order Catalytic Reactions with External Transport Limitations," C. J. Pereira, J. J. Carberry and A. Varma, Chemical Engineering Science, 34, 249-255 (1979).

20. "Substrate-Inhibited Enzyme Reaction in a Tubular Reactor with Axial Dispersion," A. L. DeVera and A. Varma, Chemical Engineering Science, 34, 275-278 (1979).

21. "Catalytic Reactions in Transport-Line Reactors," P. Varghese and A. Varma, Chemical Engineering Science, 34, 337-343 (1979).

22. "Yield Optimization for the Van de Vusse Reaction," A. L. DeVera and A. Varma, Chemical Engineering Journal, 17, 163-167 (1979).

23. "Stability of the Steady States and Transient Behavior for a Non-Isothermal Bimolecular Langmuir-Hinshelwood Reaction," C. J. Pereira and A. Varma, Chemical Engineering Science, 34, 1187-1193 (1979).

24. "Dynamics of Selectivity Reactions in Isothermal CSTRs," A. Varma and A. L. DeVera, Chemical Engineering Science, 34, 1377-1386 (1979).

25. "Mathematical Methods in Chemical Engineering," A. Varma, Chemical Engineering Education, 13, 184-188 (1979).

26. "A Justification of the Internal Isothermal Model for Gas-Solid Catalytic Reactions," C. J. Pereira, J. B. Wang and A. Varma, AIChE Journal, 25, 1036-1043 (1979).

27. "An Experimental and Theoretical Investigation of Ethylene Oxidation on Supported Platinum in an Adiabatic Fixed-Bed Reactor," S. C. Paspek and A. Varma, Chemical Engineering Science, 35, 33-40 (1980).

28. "On Shape Normalization for Non-Uniformly Active Catalyst Pellets," J. B. Wang and A. Varma, Chemical Engineering Science, 35, 613-617 (1980).

29. "Utilization of the Recycle Reactor in Determining Kinetics of Gas-Solid Catalytic Reactions," S. C. Paspek, A. Varma and J. J. Carberry, Chemical Engineering Education, 14, 78-82 (1980).

30. "Yield Optimization in a Tube-Wall Reactor," D. T.-J. Huang and A. Varma, American Chemical Society Symposium Series, 124, 469-480 (1980).

31. *The Mathematical Understanding of Chemical Engineering Systems: Selected Papers of N. R. Amundson*, R. Aris and A. Varma (Editors), Pergamon Press, 829 pgs (1980).

32. "On the Number and Stability of Steady States of a Sequence of CSTRs," A. Varma, Industrial and Engineering Chemistry Fundamentals, 19, 316-319 (1980).

33. "Optimal Bulk Phase Composition for an Isothermal Second Order Reaction in a Catalyst Slab -- Elliptic Integral Method," A. L. DeVera and A. Varma, Industrial and Engineering Chemistry Fundamentals, 19, 320-322 (1980).

34. "On the Reference Time in the Multiplicity Analysis for CSTRs," D. T.-J. Huang and A. Varma, Chemical Engineering Science, 35, 1806-1809 (1980).

35. "Gas Absorption with Consecutive Second-Order Reactions," D. T.-J. Huang, J. J. Carberry and A. Varma, AIChE Journal, 26, 832-839 (1980).

36. "Diffusion-Reaction of CO, NO and O_2 in Automotive Exhaust Catalysts," J. W. Kress, N. C. Otto, M. Bettman, J. B. Wang and A. Varma, AIChE Symposium Series, 76 (201), 202-211 (1980).

37. "Steady State and Dynamic Behavior of Fast Gas-Liquid Reactions in Non-Adiabatic CSTRs" D. T.-J. Huang and A. Varma, Chemical Engineering Journal, 21, 47-57 (1981).

38. "Steady State Multiplicity of a Non-Adiabatic Bubble Column with Fast Reactions," D. T.-J. Huang and A. Varma, AIChE Journal, 27, 111-120 (1981).

39. "Steady State Uniqueness and Multiplicity of Non-Adiabatic Gas-Liquid CSTRs; Part I: The Second-Order Reaction Model," D. T.-J. Huang and A. Varma, AIChE Journal, 27, 481-489 (1981).

40. "Steady State Uniqueness and Multiplicity of Non-Adiabatic Gas-Liquid CSTRs; Part II: Discrimination Among Rival Reaction Models," D. T.-J. Huang and A. Varma, AIChE Journal, 27, 489-495 (1981).

41. "Explicit Multiplicity Criteria for First-Order Catalytic Reactions with External Transport Limitations," M. Morbidelli and A. Varma, Chemical Engineering Science, 36, 1211-1218 (1981).

42. "Catalytic Converters for Automotive Exhausts," A. Varma, Perspectives in Computing, 1 (2), 22-27 (1981).

43. "Packed-Bed Reactors: An Overview," A. Varma, ACS Symp. Series, 168, 279-286 (1981).

44. "Simultaneous Reactions of CO, NO and O_2 in a Tubular Reactor," N. Jothi and A. Varma, AIChE Journal, 27, 848-851 (1981).

45. "Chaos in a Continuous Stirred Tank Reactor with Two Consecutive First-Order Reactions," C. Kahlert, O. E. Rossler and A. Varma, Springer Series in Chemical Physics, 18, 355-365 (1981).

46. "Some Historical Notes on the Use of Mathematics in Chemical Engineering," A. Varma, in *A Century of Chemical Engineering*, Plenum Press, 353-387 (1982).

47. "Optimal Catalyst Activity Profiles in Pellets, I. The Case of Negligible External Mass Transfer Resistance," M. Morbidelli, A. Servida and A. Varma, Ind. Eng. Chem. Fundamentals, 21, 278-284 (1982).

48. "Optimal Catalyst Activity Profiles in Pellets, II. The Case Involving External Mass Transfer Resistance," M. Morbidelli and A. Varma, Ind. Eng. Chem. Fundamentals, 21, 284-289 (1982).

49. "Parametric Sensitivity and Runaway in Tubular Reactors," M. Morbidelli and A. Varma, AIChE Journal, 28, 705-713 (1982).

50. "Simultaneous Reactions of CO, NO, O_2 and NH_3 on Pt/γAl_2O_3 Catalyst in a Tubular Reactor," B. Subramaniam and A. Varma, Chemical Engineering Communications, 20, 81-91 (1983).

51. "Isothermal Diffusion-Reaction in a Catalyst Slab with Bimolecular Langmuir-Hinshelwood Kinetics: Connections with Negative First-Order Kinetics," M. Morbidelli and A. Varma, Chemical Engineering Science, 38, 289-296 (1983).

52. "On Shape Normalization for Non-Uniformly Active Catalyst Pellets-II," M. Morbidelli and A. Varma, Chemical Engineering Science, 38, 297-305 (1983).

53. "Complex Dynamic Behavior in the Case of CO-NO-O_2-H_2O Reaction System on Pt/γAl_2O_3 Catalyst," B. Subramaniam and A. Varma, Chemical Engineering Communications, 21, 221-233 (1983).

54. "Modeling of Gas-Liquid CSTRs," A. A. Shaikh and A. Varma, ACS Symp. Series, 237, 95-106 (1984).

55. "Reactions of CO, NO, O_2 and H_2O on Three-Way and Pt/γAl_2O_3 Catalysts," B. Subramaniam and A. Varma, in *Frontiers in Chemical Reaction Engineering*, Wiley Eastern, pgs. 231-240 (1984).

56. "Gas Absorption with Chemical Reaction: The Case Involving a Volatile Liquid Reactant," A. A. Shaikh and A. Varma, Chemical Engineering Science, 39, 1639-1641 (1984).

57. "On Steady-State Uniqueness and Multiplicity in Gas-Liquid CSTRs with Fast Reactions," A. A. Shaikh and A. Varma, Chemical Engineering Journal, 29, 59-65 (1984).

58. "Consecutive Bimolecular Reactions of General Order in Gas-Liquid Reactors," M. Morbidelli, A. Servida, S. Carra and A. Varma in *Recent Advances in the Engineering Analysis of Chemically Reacting Systems,* Wiley Eastern, pgs. 336-362 (1984).

59. "Optimal Distribution of Immobilized Enzyme in a Pellet for a Substrate-Inhibited Reaction," M. Morbidelli, A. Servida and A. Varma, Biotechnology and Bioengineering, 26, 1508-1510 (1984).

60. "Optimal Catalyst Activity Profiles in Pellets, 3. The Nonisothermal Case with Negligible External Transport Limitations," M. Morbidelli, A. Servida, S. Carra and A. Varma, Ind. Eng. Chem. Fundamentals, 24, 116-119 (1985).

61. "Approximate Solutions of Nonlinear Boundary Value Problems," A. Varma and W. Strieder, IMA Journal of Applied Mathematics, 34, 165-171 (1985).

62. "On Parametric Sensitivity and Runaway Criteria of Pseudohomogeneous Tubular Reactors," M. Morbidelli and A. Varma, Chemical Engineering Science, 40, 2165-2168 (1985).

63. "Reaction Kinetics on a Commercial Three-Way Catalyst: CO-NO-O_2-H_2O System," B. Subramaniam and A. Varma, Ind. Eng. Chem. Prod. Res. Dev., 24, 512-516 (1985).

64. "Parametric Sensitivity in Fixed-Bed Catalytic Reactors: The Role of Interparticle Transfer Resistances," M. Morbidelli and A. Varma, AIChE Journal, 32, 297-306 (1986).

65. "Optimal Catalyst Activity Profiles in Pellets," A. Varma, Chapter in *Reacting Flows: Combustion and Chemical Reactors,* Part 2, Lectures in Applied Mathematics, 24, 41-62 (1986).

66. "Parametric Sensitivity and Runaway in Fixed-Bed Catalytic Reactors," M. Morbidelli and A. Varma, Chemical Engineering Science, 41, 1063-1071 (1986).

67. "Parametric Sensitivity of a CSTR," R. Chemburkar, M. Morbidelli and A. Varma, Chemical Engineering Science, 41, 1647-1654 (1986).

68. "Complex Dynamic Behavior during Ethylene Oxidation on Supported Silver Catalyst," S. V. Dhalewadikar, E. N. Martinez and A. Varma, Chemical Engineering Science, 41, 1743-1746 (1986).

69. "Optimal Catalyst Activity Profiles in Pellets, 4. Analytical Evaluation of the Isothermal Fixed-Bed Reactor," M. Morbidelli, A. Servida and A. Varma, Ind. Eng. Chem. Fundamentals, 25, 307-313 (1986).

70. "Optimal Catalyst Activity Profiles in Pellets, 5. Optimization of the Isothermal Fixed-Bed Reactor," M. Morbidelli, A. Servida, S. Carra and A. Varma, Ind. Eng. Chem. Fundamentals, 25, 313-321 (1986).

71. "Optimal Catalyst Activity Profiles in Pellets, "A. Varma, M. Morbidelli, R. Chemburkar and C. K. Lee, in *Proc. World Congress III of Chemical Engineering*, Tokyo, Japan, 4, 370-373 (1986).

72. "Reactor Steady State Multiplicity and Stability," M. Morbidelli, A. Varma and R. Aris, Chapter 15, in *Chemical Reaction and Reactor Engineering*, J. J. Carberry and A. Varma (Editors), pgs 973-1054, Marcel-Dekker (1987).

73. "Optimal Catalyst Activity Profiles in Pellets, 6. Optimization of the Isothermal Fixed-Bed Reactor with Multiple Zones," C. K. Lee, M. Morbidelli and A. Varma, Ind. Eng. Chem. Research, 26, 167-170 (1987).

74. "Parametric Sensitivity and Runaway in Chemical Reactors," M. Morbidelli and A. Varma, Sadhana, 10, 133-148 (1987).

75. "Optimal Catalyst Activity Profiles in Pellets," A. Varma, in *Recent Trends in Chemical Reaction Engineering*, Wiley Eastern, 1, 43-60 (1987).

76. "Dynamics of Consecutive Reactions in a CSTR--A Case Study," R. Chemburkar, O. Rossler and A. Varma, Chemical Engineering Science, 42, 1507-1509 (1987).

77. "Steady State Multiplicity Behavior of an Isothermal Axial Dispersion Fixed-Bed Reactor with Nonuniformly Active Catalyst," C. K. Lee, M. Morbidelli and A. Varma, Chemical Engineering Science, 42, 1595-1608 (1987).

78. "Steady State Multiplicity Behavior of an Adiabatic Plug-Flow Reactor with Nonuniformly Active Catalyst," C. K. Lee and A. Varma, Chem. Eng. Communications, 58, 287-309 (1987).

79. "Parametric Sensitivity in Tubular Polymerization Reactors," M. Tjahjadi, S. K. Gupta, M. Morbidelli and A. Varma, Chemical Engineering Science, 42, 2385-2394 (1987).

80. "Optimal Catalyst Activity Profiles in Pellets, 7. The Case of Arbitrary Reaction Kinetics with Finite External Heat and Mass Transport Resistances," R. M. Chemburkar, M. Morbidelli and A. Varma, Chemical Engineering Science, 42, 2621-2632 (1987).

81. "Parametric Sensitivity in Fixed-Bed Catalytic Reactors: Inter and Intraparticle Resistances," M. Morbidelli and A. Varma, AIChE Journal, 33, 1949-1958 (1987).

82. "A Generalized Criterion for Parametric Sensitivity: Application to Thermal Explosion Theory," M. Morbidelli and A. Varma, Chemical Engineering Science, 43, 91-102 (1988).

83. "Approximate Solutions for Nonlinear Diffusion-Reaction Equations from the Maximum Principle," M. C. Regalbuto, W. C. Strieder and A. Varma, Chemical Engineering Science, 43, 513-518 (1988).

84. "A Simulation Analysis of Gas-Liquid Reactions in Isothermal CSTRs," A. A. Shaikh and A. Varma, Hungarian Jl. Ind. Chem., 16, 121-140 (1988).

85. "An Isothermal Fixed-Bed Reactor with Nonuniformly Active Catalysts: Experiments and Theory," C. K. Lee and A. Varma, Chemical Engineering Science, 43, 1995-2000 (1988).

86. "On Steady State Multiplicity in Bubble Column Reactors," A. A. Shaikh and A. Varma, Chemical Engineering Journal, 39, 191-195 (1988).

87. "Effective Diffusivity Measurement through an Adsorbing Porous Solid," D. M. Price and A. Varma, AIChE Symp. Series, 84, (266), 88-96 (1988).

88. "Upper and Lower Bounds from the Maximum Principle: Intracellular Diffusion with Michaelis-Menten Kinetics," M. C. Regalbuto, W. Strieder and A. Varma, Bull. Math. Biology, 51, 325-335 (1989).

89. "A Generalized Criterion for Parametric Sensitivity: Application to a Pseudohomogeneous Tubular Reactor with Consecutive or Parallel Reactions," M. Morbidelli and A. Varma, Chemical Engineering Science, 44, 1675-1696 (1989).

90. "Approximate Solutions for Nonlinear Diffusion-Reaction Equations using the Maximum Principle: A Case Involving Multiple Solutions," M. C. Regalbuto, W. C. Strieder and A. Varma, Chemical Engineering Science, 44, 2063-2074 (1989).

91. "Parametric Sensitivity of Chain Polymerization Reactors Exhibiting the Trommsdorff Effect," B. Kapoor, S. K. Gupta and A. Varma, Polymer Engineering & Science, 29, 1246-1258 (1989).

92. "Parametric Sensitivity and Runaway in Chemical Reactors," *Recent Advances in Chemical Engineering*, pgs. 56-65, Tata McGraw-Hill, New Delhi (1989).

93. "Parametric Sensitivity in Tubular Reactors with Co-current External Cooling," E. Bauman, A. Varma, J. Lorusso, M. Dente and M. Morbidelli, Chemical Engineering Science 45, 1301-1307 (1990).

94. "Optimal Activity Distribution in Nonuniformly Impregnated Catalyst Particles: Numerical Analysis," R. Baratti, G. Cao, M. Morbidelli and A. Varma, Chemical Engineering Science, 45, 1643-1646 (1990).

95. "Optimal Catalyst Activity Profiles in Pellets, 8. General Nonisothermal Reacting Systems with Arbitrary Kinetics," H. Wu, A. Brunovska, M. Morbidelli and A. Varma, Chemical Engineering Science, 45, 1855-1862 (1990).

96. "Ethylene Oxidation Over α–Alumina Supported Silver-Gold Catalysts," R-Herrera, A. Varma and E. N. Martinez, in *New Developments in Selective Oxidation*, G. Centi and F. Trifiro (Editors), Elsevier, 717-724 (1990).

97. "Parametric Sensitivity and Runaway in Catalytic Reactors: Experiments and Theory Using Carbon Monoxide Oxidation as an Example," E. G. Bauman and A. Varma, Chemical Engineering Science, 45, 2133-2139 (1990).

98. "Self-Propagating Solid-Solid Noncatalytic Reactions in Finite Pellets," A. Varma, G. Cao and M. Morbidelli, AIChE Journal, 36, 1032-1038 (1990).

99. "Microcomputer-Automated Reactor for Synthesis of ^{13}C-Labeled Monosaccharides," U. Stafford, A. S. Serianni and A. Varma, AIChE Journal, 36, 1822-1828 (1990).

100. "Kinetics of α- and β- Si_3N_4 Formation from Oxide-Free High-Purity Silicon Powder," A. Varma, R. G. Pigeon and A. E. Miller, Journal of Materials Science, 26, 4541-4544 (1991).

101. "Approximate Solutions for Nonlinear Diffusion-Reaction Equations Using the Maximum Principle: The Effects of Pellet Geometry," M. C. Regalbuto, W. Strieder and A. Varma, Chemical Engineering Science, 46, 3317-3319 (1991).

102. "Remarks on Self-Propagating Reactions in Finite Pellets," G. Cao, A. Varma and M. Morbidelli, AIChE Journal, 37, 1420-1424 (1991).

103. "Combustion Synthesis of the $YBa_2Cu_3O_{7-x}$ Superconductor," J.-P. Lebrat and A. Varma, Physica C, 184, 220-228 (1991).

104. "Combustion Synthesis of Ni_3Al and Ni_3Al-Matrix Composites, "J.-P. Lebrat, A. Varma and A. E. Miller, Metallurgical Transactions A, 23A, 69-76 (1992).

105. "Optimal Catalyst Activity Profiles in Pellets - 9. Study of Ethylene Epoxidation," A. Gavriilidis and A. Varma, AIChE Journal, 38, 291-296 (1992).

106. "Self-Propagating Reactions in Finite Pellets: Theory and Experiments," A. Varma, G. Cao, J.-P. Lebrat and M. Morbidelli, International Journal of Self-Propagating High-Temperature Synthesis (Inaugural issue), 1, 9-18 (1992).

107. "Combustion Synthesis of the $YBa_2Cu_3\ O_{7-x}$ Superconductor," J.-P. Lebrat and A. Varma, Solid State Phenomena, 25, 233-240 (1992).

108. "Combustion Synthesis of Advanced Materials," A. Varma and J.-P. Lebrat, Chemical Engineering Science, 47, 2179-2194 (1992).

109. "Some Chemical Reaction Engineering Considerations in the Synthesis of Silicon Nitride," R. G. Pigeon and A. Varma, Chemical Engineering Science, 47, 2585-2590 (1992).

110. "Quantitative Phase Analysis of Si_3N_4 by X-Ray Diffraction", R. G. Pigeon and A. Varma, Journal of Materials Science Letters, 11, 1370-1372 (1992).

111. "Some Further Studies in Combustion Synthesis of the $YBa_2Cu_3O_{7-x}$ Superconductor," J.-P. Lebrat and A. Varma, Combustion Science and Technology, 88, 177-185 (1992).

112. "Self-Propagating High-Temperature Synthesis of Ni_3Al," J.-P. Lebrat and A. Varma, Combustion Science and Technology, 88, 211-221 (1992).

113. "Influence of Loading on Metal Surface Area for $Ag/\alpha\text{-}Al_2O_3$ Catalysts," A. Gavriilidis, B. Sinno and A. Varma, Journal of Catalysis, 139, 41-47 (1993).

114. "Optimal Catalyst Activity Profiles in Pellets, 10. The Role of Catalyst Loading," R. Baratti, H. Wu, M. Morbidelli and A. Varma, Chemical Engineering Science, 48, 1869-1881 (1993).

115. "Thermal Sensitivity and Runaway in Chemical Reacting Systems," G. Cao, M. Morbidelli and A. Varma, Chapter in *Chemical Reactor Technology for Environmentally Safe Reactors and Products*, pgs 443-466, NATO-ASI Series, Kluwer Academic Publishers (1993).

116. "Some Factors Influencing the Formation of Reaction-Bonded Silicon Nitride," R. G. Pigeon, A. Varma and A. E. Miller, Journal of Materials Science, 28, 1919-1936 (1993).

117. "An In-Situ Diffuse Reflectance FTIR Investigation of Photocatalytic Degradation of 4- Chlorophenol on a TiO_2 Powder Surface," U. Stafford, K. A. Gray, P. V. Kamat and A. Varma, Chemical Physics Letters, 205, 55-61 (1993).

118. "Optimal Distribution of Silver Catalyst for Epoxidation of Ethylene," A. Gavriilidis and A. Varma, in *Catalytic Selective Oxidation*, S. T. Oyama and J. W. Hightower (Editors), ACS Symposium Series, 523, 410-415 (1993).

119. "Approximate Solutions for Nonlinear Gas-Solid Noncatalytic Reactions," G. Cao, A. Varma and W. Strieder, AIChE Journal, 39, 913-917 (1993).

120. "Optimal Distribution of Catalyst in Pellets," A. Gavriilidis, A. Varma and M. Morbidelli, Catalysis Reviews-Science and Engineering, 35, 399-456 (1993).

    also Chapter 6 in *Computer-Aided Design of Catalysts*, E. R. Becker and C. J. Pereira (Editors), pgs. 137-198, Marcel-Dekker (1993).

121. "Quantitative Kinetic Analysis of Silicon Nitridation," R. G. Pigeon and A. Varma, Journal of Materials Science, 28, 2999-3013 (1993).

122. "Selective Oxidation of Butane to Maleic Anhydride on a Vanadium-Phosphorus Oxide Catalyst: Promotional Effects of Zirconium," R. Sant and A. Varma, Journal of Catalysis, 143, 215-226 (1993).

123. "Self-Propagating Reactions in Finite Pellets: Synthesis of Titanium Carbide," J.-P. Lebrat and A. Varma, AIChE Journal, 39, 1732-1734 (1993).

124. "Combustion Synthesis of Intermetallic Aluminides: Processing and Mechanistic Studies," C. R. Kachelmyer, J.-P. Lebrat, A. Varma and P. J. McGinn, in HTD-Vol. 250, *Heat Transfer in Fire and Combustion Systems*, pgs 271-276, ASME (1993).

125. "The Mechanism of a Self-Propagating High-Temperature Synthesis of Nickel Aluminides," A. S. Rogachev, A. Varma and A. G. Merzhanov, International Journal of Self-Propagating High-Temperature Synthesis, 2, 25-38 (1993).

126. "Activated Carbon Adsorption and Desorption of Toluene in the Aqueous Phase: Experiments and Model," D. Chatzopoulos, A. Varma and R. L. Irvine, AIChE Journal, 39, 2027-2041 (1993).

127. "Adsorption and Desorption Studies in the Aqueous Phase for the Toluene/Activated Carbon System," D. Chatzopoulos, A. Varma and R. L. Irvine, Environmental Progress, 13, 21-25 (1994).

128. "Mechanistic Studies in Combustion Synthesis of Ni_3Al and Ni_3Al - matrix Composites," J.-P. Lebrat, A. Varma and P. J. McGinn, Journal of Materials Research, 9, 1184-1192 (1994).

129. "Some Observations on Unstable Self-Propagating High-Temperature Synthesis of Nickel Aluminides, "L. Wenning, J. - P. Lebrat and A. Varma, Journal of Materials Synthesis and Processing, 2, 125-132 (1994).

130. "Optimization of a Non-Isothermal Non-Adiabatic Fixed-Bed Reactor Using Dirac-type Silver Catalysts for Ethylene Epoxidation," R. Baratti, A. Gavriilidis, M. Morbidelli and A. Varma, Chemical Engineering Science, 49, 1925-1936 (1994).

131. "Combustion Synthesis of Niobium Aluminide Matrix Composites," C. R. Kachelmyer and A. Varma, in *Intermetallic Matrix Composites - III*, Materials Research Society, 33-39 (1994).

132. "Nonuniform Catalyst Distribution for Inorganic Membrane Reactors: Theoretical Considerations and Preparation Techniques," K. L. Yeung, R. Aravind, R. J. X. Zawada, J. Szegner, G. Cao and A. Varma, Chemical Engineering Science, 49, 4823-4838 (1994).

133. "Mechanisms of Structure Formation during Combustion Synthesis of Materials," A. S. Rogachev, V. A. Shugaev, C. R. Kachelmyer and A. Varma, Chemical Engineering Science, 49, 4949-4958 (1994).

134. "The Mechanism of Self-Propagating High-Temperature Synthesis of Nickel Aluminides, II. Crystal Structure Formation in a Combustion Wave," A. S. Rogachev, I. O. Khomenko, A. Varma, A. G. Merzhanov and V. I. Ponamarev, International Journal of Self-Propagating High-Temperature Synthesis, 3, 239-252 (1994).

135. "A New Expression for Velocity of the Combustion Front during Self-Propagating High-Temperature Synthesis," G. Cao and A. Varma, Combustion Science and Technology, 102, 181-191 (1994).

136. "Analysis and Shape Inequalities for Gas-Solid Reactions with Changing Volume," G. Cao, W. Strieder and A. Varma, AIChE Journal, 41, 324-336 (1995).

137. "Aqueous-Phase Adsorption and Desorption of Toluene in Activated Carbon Fixed Beds: Experiments and Model," D. Chatzopoulos and A. Varma, Chemical Engineering Science, 50, 127-141 (1995).

138. "The Sharp Interface Model: Zero-Order Reaction with Volume Change," M. Maalmi, A. Varma and W. Strieder, Industrial and Engineering Chemistry Research, 34, 1114-1125 (1995).

139. "Novel Preparation Techniques for Thin Metal-Ceramic Composite Membranes," K. L. Yeung and A. Varma, AIChE Journal, 41, 2131-2139 (1995).

140. "Novel Preparation of Pd/Vycor Composite Membranes," K. L. Yeung, J. M. Sebastian and A. Varma, Catalysis Today, 25, 231-236 (1995).

141. "Mechanistic and Processing Studies in Combustion Synthesis of Niobium Aluminides," C. R. Kachelmyer, A. S. Rogachev and A. Varma, Journal of Materials Research, 10, 2260-2270 (1995).

142. "On the Mechanism of Structure Formation during Combustion Synthesis of Titanium Silicides," A. S. Rogachev, A. Varma, V. A. Shugaev, I. Khomenko and C. R. Kachelmyer, Combustion Science and Technology, 109, 53-70 (1995).

143. "Influence of Mass Transfer Coefficient Fluctuation Frequency on Performance of Three-Phase Packed-Bed Reactors," R. Wu, M. J. McCready and A. Varma, Chemical Engineering Science, 50, 3333-3344 (1995).

144. "Preparation of Pt/γ-Al_2O_3 Pellets with Internal Step-Distribution of Catalyst: Experiments and Theory," P. Papageorgiou, D.M. Price, A. Gavriilidis and A. Varma, Journal of Catalysis, 158, 439-451 (1996).

145. "Mechanistic Studies in the Combustion Synthesis of Aluminides and Silicides," A. Varma, C. R. Kachelmyer and A. S. Rogachev, International Journal of Self-Propagating High-Temperature Synthesis, 5, 1-25 (1996).

146. "Metal Composite Membranes: Synthesis, Characterization and Reaction Studies," K. L. Yeung, R. Aravind, J. Szegner and A. Varma, Studies in Surface Science and Catalysis, 101, 1349-1358 (1996).

147. "Gravity-Induced Microstructural Non-uniformities during Combustion Synthesis of Intermetallic-Ceramic Composite Materials," H. C. Yi, A. Varma, A. S. Rogachev and P. J. McGinn, Industrial and Engineering Chemistry Research, 35, 2982-2985 (1996).

148. "Combustion Wave Microstructure in Heterogeneous Gasless Systems," A.S. Mukasyan, S. Hwang, A.E. Sytchev, A.S. Rogachev, A.G. Merzhanov and A. Varma, Combustion Science and Technology, 115, 335-353 (1996).

149. "Investigation of Phase Transformations and Ordering during Combustion Synthesis," C. R. Kachelmyer, A. Varma, I. O. Khomenko, A. S. Rogachev and A. G. Merzhanov in *Thermodynamics and Kinetics of Phase Transformations*, Materials Research Society, 398, 593-598 (1996).

150. "Intrinsic Nitridation Kinetics of High-Purity Silicon Powder," M. Maalmi and A. Varma, AIChE Journal, 42, 3477-3483 (1996).

151. "Optimal Distribution of Catalyst for a Case Involving Heterogeneous and Homogeneous Reactions," S. Melis, A. Varma and C. J. Pereira, Chemical Engineering Science, 52, 165-169 (1997).

152. "Mesoporous Alumina Membranes: Synthesis, Characterization, Thermal Stability and Nonuniform Distribution of Catalyst," K.L. Yeung, J.M. Sebastian and A. Varma, Journal of Membrane Science, 131, 9-28 (1997).

153. "Combustion Wave Microstructure in Gas-Solid Reaction Systems: Experiments and Theory," S. Hwang, A.S. Mukasyan, A.S. Rogachev and A. Varma, Combustion Science and Technology, 123, 165-184 (1997).

154. "Propagation Velocity of the Reaction Front in Addition Polymerization Systems," M. Apostolo, A. Tredici, M. Morbidelli and A. Varma, Journal of Polymer Science A, 35, 1047-1059 (1997).

155. "Spatiotemporal Evolution of Conversion and Selectivity for Simultaneous Noncatalytic Gas-Solid Reactions in a Compact of Particles," M. Maalmi, W.C. Strieder and A. Varma, Industrial and Engineering Chemistry Research, 36, 1470-1479 (1997).

156. "Optimal Catalyst Activity Profiles in Pellets - XI. The Case of Multiple-Step Distributions," R. Baratti, V. Feckova, M. Morbidelli and A. Varma, Industrial and Engineering Chemistry Research, 36, 3416-3420 (1997).

157. "Effect of Catalyst Distribution in a Membrane Reactor: Experiments and Model," J. Szegner, K.L. Yeung and A. Varma, AIChE Journal, 43, 2059-2072 (1997).

158. "The Effects of Gravity on Combustion Synthesis in Heterogeneous Gasless Systems," A. Mukasyan, A. Pelekh, A. Varma, A. Rogachev and A. Jenkins, AIAA Journal, 35, 1821-1828 (1997).

159. "Combustion Synthesis in Gasless Systems Under Microgravity Conditions," A. Mukasyan, A. Pelekh and A. Varma, J. Materials Synthesis and Processing, 5, 391-400 (1997).

160. "A Time-Resolved X-ray Diffraction Study of Ti_5Si_3 Product Formation during Combustion Synthesis," C. R. Kachelmyer, I. O. Khomenko, A. S. Rogachev and A. Varma, Journal of Materials Research, 12, 3230-3240 (1997).

161. "Combustion Synthesis of Advanced Materials: Principles and Applications," A. Varma, A.S. Rogachev, A.S. Mukasyan and S. Hwang, *Advances in Chemical Engineering*, 24, 79-226 (1998).

162. "Effects of 1,2 Dichloroethane Addition on the Optimal Silver Catalyst Distribution in Pellets for Epoxidation of Ethylene," K.L. Yeung, A. Gavriilidis, A. Varma and M.M. Bhasin, Journal of Catalysis, 174, 1-12 (1998).

163. "Reaction-Bonded Silicon Nitride Synthesis: Experiments and Model," M. Maalmi, A. Varma and W.C. Strieder, Chemical Engineering Science, 53, 679-689 (1998).

164. "Mechanisms of Combustion Wave Propagation in Heterogeneous Reaction Systems," S. Hwang, A.S. Mukasyan and A. Varma, Combustion and Flame, 115, 354-363 (1998).

165. "Pseudo-Adiabatic Operation and Runaway in Tubular Reactors," H. Wu, M. Morbidelli and A. Varma, AIChE Journal, 44, 1157-1169 (1998).

166. "An Approximate Criterion for Reactor Thermal Runaway," H. Wu, M. Morbidelli and A. Varma, Chemical Engineering Science, 53, 3341-3344 (1998).

167. “The Influence of Reaction Mixture Porosity on the Effective Kinetics of Gasless Combustion Synthesis,” C.R. Kachelmyer, A. Varma, A.S. Rogachev and A.E. Sytschev, Industrial and Engineering Chemistry Research, 37, 2246-2249 (1998).

168. “Combustion Synthesis of Advanced Materials,” A. Varma and A.S. Mukasyan, *ASM Handbook*, 7, 523-540 (1998).

169. “Ethylene Epoxidation in a Catalytic Packed-Bed Membrane Reactor,” M.A. Pena, D.M. Carr, K.L. Yeung and A. Varma, Chemical Engineering Science, 53, 3821-3834 (1998).

170. “Complex Behavior of Self-Propagating Reaction Waves in Heterogeneous Media,” A. Varma, A.S. Rogachev, A.S. Mukasyan and S. Hwang, Proc. National Academy of Sciences USA, 95, 11053-11058 (1998).

171. "Effect of Pulsing on Reaction Outcome in a Gas-Liquid Catalytic Packed-Bed Reactor,” R. Wu, M.J. McCready and A. Varma, Catalysis Today, 48, 195-198 (1999).

172. “Kinetics of Rapid High-Temperature Reactions: Titanium-Nitrogen System,” A.E. Pelekh, A.S. Mukasyan and A. Varma, Industrial and Engineering Chemistry Research, 38, 793-798 (1999).

173. “Mechanisms of Reaction Wave Propagation During Combustion Synthesis of Advanced Materials,” A.S. Mukasyan, A.S. Rogachev and A. Varma, Chemical Engineering Science, 54, 3357-3367 (1999).

174. “Study of Structure Formation during Electroless Plating of Thin Metal Composite Membranes,” R.S. Souleimanova, A.S. Mukasyan and A. Varma, Chemical Engineering Science 54, 3369-3377 (1999).

175. "Microstructure of Self-Propagating Reaction Waves in Heterogeneous Media", A.S. Rogachev, A.S. Mukasyan and A. Varma, Doklady Chemistry, 366, 777-780 (1999).

176. “Parametric Sensitivity in Fixed-Bed Catalytic Reactors with Reverse-Flow Operation,” H. Wu, R. Rota, M. Morbidelli and A. Varma, Chemical Engineering Science, 54, 4579-4588 (1999).

177. “Palladium Composite Membranes by Electroless Plating Technique: Relationships between plating kinetics, film microstructure and membrane performance,” K.L. Yeung, S.C. Christiansen and A. Varma, Journal of Membrane Science, 159, 107-122 (1999).

178. “Mechanisms of Pulsating Combustion during Synthesis of Advanced Materials,” A.S. Mukasyan, A.S. Rogachev and A. Varma, AIChE Journal, 45, 2580-2585 (1999).

179. “Ethylene Epoxidation in a Catalytic Packed-Bed Membrane Reactor: Effects of Reactor Configuration and 1,2-Dichloroethane Addition,” D. Lafarga and A. Varma, Chemical Engineering Science, 55, 749-758 (2000).

180. “Effects of Osmosis on Microstructure of Pd-Composite Membranes Synthesized by Electroless Plating Technique," R.S. Souleimanova, A.S. Mukasyan and A. Varma, Journal of Membrane Science, 166, 249-257 (2000).

181. “Electrothemography Apparatus for Kinetics of Rapid High-Temperature Reactions," A. Pelekh, A.S. Mukasyan and A. Varma, Review of Scientific Instruments, 71, 220-223 (2000).

182. “Ethylene Epoxidation on Ag-Cs/α-Al_2O_3 Catalyst: Experimental Results and Strategy for Kinetic Parameter Determination,” D. Lafarga, M.A. Al-Juaied, C.M. Bondy and A. Varma, Industrial and Engineering Chemistry Research, 39, 2148-2156 (2000).

183. “Form from Fire," A. Varma, Scientific American, 283 (2), 58-61 (2000).

184. “The Role of Infiltration on Spin Combustion in Gas-Solid Systems,” A.S. Mukasyan, J.A. Marasia, I.A. Filimonov and A. Varma, Combustion and Flame, 122, 368-374 (2000).

185. “Influence of Preheating Rate on Kinetics of High-Temperature Gas-Solid Reactions,” L. Thiers, B.J. Leitenberger, A.S. Mukasyan and A. Varma, AIChE Journal, 46, 2518-2524 (2000).

186. “Microstructural Mechanism of Combustion in Heterogeneous Reaction Media,” A.S. Mukasyan, A.S. Rogachev and A. Varma, Proc. Combustion Institute, 28, 1413-1419 (2000).

187. “Chemical Engineering Award Lecture: Combustion Synthesis of Advanced Materials,” A. Varma, Chemical Engineering Education, 35, (1), 14-21 (2001).

188. “Ethylene Epoxidation in a Catalytic Packed-Bed Membrane Reactor: Experiments and Model,” M.A. Al-Juaied, D. Lafarga and A. Varma, Chemical Engineering Science, 56, 395-402 (2001).

189. “Dynamics of Self-Propagating Reactions in Heterogeneous Media: Experiments and Model,” A. Varma, A.S. Mukasyan and S. Hwang, Chemical Engineering Science, 56, 1459-1466 (2001).

190. "Mechanistic Studies in Combustion Synthesis of NiAl-TiB_2 Composites: Effects of Gravity," C. Lau, A. Mukasyan, A. Pelekh and A. Varma, Journal of Materials Research, 16, 1614-1625 (2001).

191. "Kinetics of High-Temperature Reaction in Titanium-Nitrogen System: Nonisothermal Conditions," L. Thiers, A. Mukasyan, A. Pelekh and A. Varma, Chemical Engineering Journal, 82, 303-310 (2001).

192. "Perovskite Membranes by Aqueous Combustion Synthesis: Synthesis and Properties," A. Mukasyan, C. Costello, K. Sherlock, D. Lafarga and A. Varma, Separation and Purification Technology, 25, 117-126 (2001).

193. "Pd-Composite Membranes Prepared by Electroless Plating and Osmosis: Synthesis, Characterization and Properties," R. Souleimanova, A. Mukasyan and A. Varma, Separation and Purification Technology, 25, 79-86 (2001).

194. "Methanol Oxidative Dehydrogenation in a Catalytic Packed-Bed Membrane Reactor," V. Diakov, D. Lafarga and A. Varma, Catalysis Today, 67, 159-167 (2001).

195. "Gasless Combustion of Aluminum Particles Clad by Nickel," A.S. Mukasyan, C. Lau and A. Varma, Combustion Science and Technology, 170, 67-85 (2001).

196. "Ligand Diffusion and Receptor Mediated Internalization: Michaelis-Menten Kinetics," M. Maalmi, W. Strieder and A. Varma, Chemical Engineering Science, 56, 5609-5616 (2001).

197. "Enhancing Performance of Three-Phase Catalytic Packed-Bed Reactors," B.A. Wilhite, R. Wu, X. Huang, M.J. McCready and A. Varma, AIChE Journal, 47, 2548-2556 (2001).

198. "Combustion Synthesis of Intermetallic Compounds," A. Varma and A.S. Mukasyan, in *Self-Propagating High-Temperature Synthesis of Materials*, Editors: A. Borisov, L. DeLuca and A. Merzhanov, pgs 1-34, Taylor & Francis, New York (2002).

199. "Pd Membranes Formed by Electroless Plating with Osmosis: H_2 Permeation Studies," R. S. Souleimanova, A.S. Mukasyan and A. Varma, AIChE Journal, 48, 262-268 (2002).

200. "Mechanism of Combustion in Low-Exothermic Mixtures of Sodium Chlorate and Metal Fuel," E. Shafirovich, A.S. Mukasyan, A. Varma, G. Kshirsagar, Y. Zhang and J.C. Cannon, Combustion and Flame, 128, 133-144 (2002).

201. "Methanol Oxidative Dehydrogenation in a Catalytic Packed–Bed Membrane Reactor: Experiments and Model," V. Diakov, B. Blackwell and A. Varma, Chemical Engineering Science, 57, 1563-1569 (2002).

202. "Reactant Distribution by Inert Membrane Enhances Packed-Bed Reactor Stability," V. Diakov and A. Varma, Chemical Engineering Science, 57, 1099-1105 (2002).

203. "Volume Combustion Modes in Heterogeneous Reaction Systems," A.S. Rogachev, A.S. Mukasyan and A. Varma, Journal of Materials Synthesis and Processing, 10, 29-34 (2002).

204. "Novel Synthesis of Orthopaedic Implant Materials," A. Varma, B. Li and A.S. Mukasyan, Advanced Engineering Materials, 4, 482-487 (2002).

205. "Ignition and Combustion of Al Particles Clad by Ni," E. Shafirovich, A. Mukasyan, L. Thiers, A. Varma, B. Legrand, C. Chauveau and I. Gokalp, Combustion Science and Technology, 174, 125-140 (2002).

206. "Kinetics of Phenylacetylene Hydrogenation on Pt/γ-Al_2O_3 Catalyst," B.A. Wilhite, M.J. McCready and A. Varma, Industrial and Engineering Chemistry Research, 41, 3345-3350 (2002).

207. "Novel Approach for Thin Dense Nanoscale-Grained Metal Films," A. Varma, K. L. Yeung, R. S. Souleimanova and A. S. Mukasyan, Industrial and Engineering Chemistry Research, 41, 6323-6325 (2002).

208. "Thermal Explosion in Ni-Al System: Influence of Reaction Medium Microstructure," L. Thiers, A. Mukasyan and A. Varma, Combustion and Flame, 131, 198-209 (2002).

209. "Materials Synthesis by Reduction-Type Combustion Reactions: Influence of Gravity," C. Lau, A.S. Mukasyan and A. Varma, Intl. Symposium on Combustion, 29, 1101-1108 (2002).

210. "Quenching of Combustion Waves in Heterogeneous Reaction Systems: Time-Resolved Thermal Vision Studies," A. Rogachev, A.S. Mukasyan and A. Varma, Combustion Science and Technology, 175, 357-372 (2003).

211. "Reaction and Phase Separation Mechanisms during Synthesis of Alloys by Thermite Type Combustion Reactions," C. Lau, A.S. Mukasyan and A. Varma, Journal of Materials Research, 18, 121-128 (2003).

212. "Methanol Oxidative Dehydrogenation in a Packed-Bed Membrane Reactor: Yield Optimization Experiments and Model," V. Diakov and A. Varma, Chemical Engineering Science, 58, 801-807 (2003).

213. "Phenylacetylene Hydrogenation in a Three-Phase Catalytic Packed-Bed Reactor: Experiments and Model," X. Huang, B.A. Wilhite, M.J. McCready and A. Varma, Chemical Engineering Science, 58, 3465-3471 (2003).

214. "Effects of Induced-Pulsing Flow on Trickle-Bed Reactor Performance", B.A. Wilhite, X. Huang, M.J. McCready and A. Varma, Industrial and Engineering Chemistry Research, 42, 2139-2145 (2003).

215. "Packed-Bed Reactor Performance Enhancement by Membrane Distributed Feed: The Case of Methanol Oxidative Dehydrogenation," V. Diakov and A. Varma, in *Membranes – Preparation, Properties and Applications,* Materials Research Society, 752, 337-342 (2003).

216. "Aqueous Combustion Synthesis of Strontium-Doped Lanthanum Chromite Ceramics," K. Deshpande, A. Mukasyan and A. Varma, Journal of the American Ceramic Society, 86, 1149-1154 (2003).

217. "Combustion Synthesis of CoCrMo (F-75) Implant Alloys: Microstructure and Properties," B. Li, A.S. Mukasyan and A. Varma, Materials Research Innovations, 7, 245-252 (2003).

218. "Future Directions in Chemical Engineering Education: A New Path to Glory," A. Varma, Chemical Engineering Education, 37 (4), 284-289 (2003).

219. "Glucose Hydrogenation in a Membrane Trickle-Bed Reactor," V. Diakov and A. Varma, AIChE Journal, 49, 2933-2936 (2003).

220. "Theoretical Considerations in the Engineering of Catalyst Particles, Pellets and Extrudates," H. Wu, M. Morbidelli and A. Varma, in *Engineering Catalyst Particles, Pellets and Extrudates – 2002 Catalytic Advances Program Report*, The Catalyst Group, Spring House, PA (2003).

221. "Combustion Fluctuations in Low-Exothermic Condensed Systems for Emergency Oxygen Generation," E. Shafirovich, C. Zhou, A.S. Mukasyan, A. Varma, G. Kshirsagar, Y. Zhang, and J.C. Cannon, Combustion and Flame 135, 557-561 (2003).

222. "Optimal Feed Distribution in a Packed-Bed Membrane Reactor: The Case of Methanol Oxidative Dehydrogenation," V. Diakov and A. Varma, Industrial and Engineering Chemistry Research 43 309-314 (2004).

223. "Processing of Mesocarbon Microbeads to High-Performance Materials: Part I. Studies Towards the Sintering Mechanism," C. Norfolk, A. Mukasyan, D. Hayes, P. McGinn and A. Varma, Carbon 42, 11-19 (2004).

224. "Combustion Synthesis of Advanced Materials," A. Varma and A. Mukasyan, Korean Journal of Chemical Engineers 21, 527-536 (2004).

225. "Oxidizer-Fuel Interactions in Aqueous Combustion Synthesis, I: Iron (III) Nitrate – Model Fuels," P. Erri, P. Pranda and A. Varma, Industrial & Engineering Chemistry Research, 43, 3092-3096 (2004).

226. "Combustion Synthesis of Nanoscale Oxide Powders: Mechanism, Characterization and Properties," A. Varma, A. Mukasyan, K. Deshpande, P. Pranda and P. Erri, Materials Research Society Symposium Proceedings 800, 113-124 (2004).

227. "Microstructural Correlations between Reaction Medium and Combustion Wave Propagation in Heterogeneous Systems," A.S. Mukasyan, A.S. Rogachev, M. Mercedes and A. Varma, Chemical Engineering Science 59, 5099-5105 (2004).

228. "Direct Synthesis of Iron Oxide Nanopowders by Combustion Approach: Reaction Mechanism and Properties," K. Deshpande, A. Mukasyan and A. Varma, Chemistry of Materials 16, 4896-4904 (2004).

229. "Heat Transfer Characterization of Gas-Liquid Flows in a Trickle-Bed," X. Huang, A. Varma and M.J. McCready, Chemical Engineering Science 59, 3767-3776 (2004).

230. "Effect of Heating Rate on Kinetics of Rapid High-Temperature Reactions in Condensed Heterogeneous Media: Mo-Si System," S. Kharatyan, H. Chatilyan, A. S. Mukasyan, D. Simonetti and A. Varma, AIChE Journal 51, 261-270 (2005).

231. "Review: Influence of Gravity on Combustion Synthesis of Advanced Materials,"A. S. Mukasyan, C. Lau and A. Varma, AIAA Journal 43, 225-246 (2005).

232. "Origins of Pulsing Regime in Cocurrent Packed-Bed Flows", B.A. Wilhite, B. Blackwell, J. Kacmar, A. Varma and M.J. McCready, Industrial & Engineering Chemistry Research 44, 6056-6066 (2005).

233. "Novel Ferrimagnetic Iron Oxide Nanopowders," K. Deshpande, M. Nersesyan, A. Mukasyan and A. Varma, Industrial & Engineering Chemistry Research, 44, 6196-6199 (2005).

234. "Heterogeneous Combustion: Recent Developments and New Opportunities for Chemical Engineers," A. Varma, V. Diakov and E. Shafirovich, *Perspective Article*, AIChE Journal, 51, 2876-2884 (2005).

235. "Processing of Mesocarbon Microbeads to High-Performance Materials: Part II. Reaction Bonding by In-Situ Silicon Carbide and Nitride Formation," C. Norfolk, A. Mukasyan, D. Hayes, P. McGinn and A. Varma, Carbon, 44, 293-300 (2006).

236. "Processing of Mesocarbon Microbeads to High-Performance Materials: Part III. High-Temperature Sintering and Graphitization," C. Norfolk, A. Kaufmann, A. Mukasyan and A. Varma, Carbon, 44, 301-306 (2006).

237. "Combustion of Novel Chemical Mixtures for Hydrogen Generation," E. Shafirovich, V. Diakov and A. Varma, Combustion and Flame, 144, 415-418 (2006).

238. "A Numerical Study of Combustion Stability in Emergency Oxygen Generators," V. Diakov, E. Shafirovich and A. Varma, AIChE Journal, 52, 1495-1501 (2006).

239. "High Throughput Evaluation of Perovskite-Based Anode Catalysts for Direct Methanol Fuel Cells", K. Deshpande, A. Mukasyan and A. Varma, Journal of Power Sources, 158, 60-68 (2006).

240. "Single and Multi-Wall Carbon Nanotubes by Floating Catalyst Method: Synthesis, Purification and Hydrogen-uptake Measurements," Y.-Y. Fan, A. Kaufmann, A. Mukasyan and A. Varma, Carbon, 44, 2160-2170 (2006).

241. "Novel Perovskite-Based Catalysts for Autothermal JP-8 Fuel Reforming," P. Erri, P. Dinka and A. Varma, Chemical Engineering Science, 61, 5328-5333 (2006).

242. "Catalytic Effects of Metals on Thermal Decomposition of Sodium Chlorate for Emergency Oxygen Generators," E. Shafirovich, C. Zhou, S. Ekambaram, A. Varma, G. Kshirsagar and J.Ellison, Industrial & Engineering Chemistry Research, 46, 3073-3077 (2007).

243. "Combustion-Assisted Hydrolysis of Sodium Borohydride for Hydrogen Generation," E. Shafirovich, V. Diakov and A. Varma, International Journal of Hydrogen Energy, 32, 207-211 (2007).

244. "Ignition Mechanism of Nickel-Coated Aluminum Particles," T. Andrzejak, E. Shafirovich and A. Varma, Combustion and Flame, 150, 60-70 (2007).

245. "Mechanistic Studies of Combustion Stimulated Generation of Hydrogen from Sodium Borohydride," V. Diakov, M.Diwan, E. Shafirovich and A. Varma, Chemical Engineering Science, 62, 5586-5591 (2007).

246. "Apparatus for Studies of High-Temperature Chemical Reactions in Single Particle Systems," T. Andrzejak, E. Shafirovich, D. Taylor and A. Varma, Review of Scientific Instruments, 78 (8), art. 085102, 7 pages (2007).

247. "Solution Combustion Synthesized Oxygen Carriers for Chemical Looping Combustion," P. Erri and A. Varma, Chemical Engineering Science, 62, 5682-5687 (2007).

248. "Spinel-Supported Oxygen Carriers for Inherent CO_2 Separation during Power Generation," P. Erri and A.Varma, Industrial & Engineering Chemistry Research, 46, 8597-8601 (2007).

249. "Combustion of Levitated Titanium Particles in Air," E. Shafirovich, S.K. Teoh and A. Varma, Combustion and Flame, 152, 262-271 (2008).

250. "Noncatalytic Hydrothermolysis of Ammonia Borane," M. Diwan, V. Diakov, E. Shafirovich and A. Varma, International Journal of Hydrogen Energy, 33, 1135-1141 (2008).

251. "Controlling Combustion Wave Front Propagation for Transition Metal/Alloy/Cermet Foam Synthesis," P. Erri, J. Nader and A. Varma, Advanced Materials, 20, 1243-1245 (2008).

252. "Metal-CO_2 Propulsion for Mars Missions: Current Status and Opportunities," E. Shafirovich and A. Varma, Journal of Propulsion and Power, 24, 385-394 (2008).

253. "Ignition of Iron-Coated and Nickel-Coated Aluminum Particles: Studies under Normal and Reduced Gravity Conditions," T. Andrzejak, E. Shafirovich and A. Varma, Journal of Propulsion and Power, 24, 805-813 (2008).

254. "Diffusional Effects in NiO Reduction Kinetics," P. Erri and A. Varma, Industrial & Engineering Chemistry Research, 48, 4-6 (2009).

255. "On the Mechanisms of Titanium Particle Reactions in O_2/N_2 and O_2/Ar Atmospheres," T. Andrzejak, E. Shafirovich and A. Varma, Propellants, Explosives, Pyrotechnics, 34, 53–58 (2009).

256. "Underground Coal Gasification: A Brief Review of Current Status," E. Shafirovich and A. Varma, Industrial & Engineering Chemistry Research, 48, 7865-7875 (2009).

257. "Microstructural Transformations and Kinetics of High-Temperature Heterogeneous Gasless Reactions by High-Speed X-Ray Phase Contrast Imaging," R. V. Reeves, J. D.E. White, E. M. Dufresne, K. Fezzaa, S. F. Son, A. Varma and A. S. Mukasyan, Physical Review B, 80, 224103-1 to -8 (2009).

258. "Combustion Wave Propagation in Magnesium/Water Mixtures: Experiments and Model," M. Diwan, D. Hanna, E. Shafirovich and A. Varma, Chemical Engineering Science, 65, 80-87 (2010).

259. "Catalytic Hydrolysis of Ammonia Borane: Intrinsic Parameter Estimation and Validation," S. Basu, Y. Zheng, A. Varma, W.N. Delgass and J. P. Gore, Journal of Power Sources, 195, 1957-1963 (2010).

260. "Method to Release Hydrogen from Ammonia Borane for Portable Fuel Cell Applications," M. Diwan, D. Hanna and A. Varma, International Journal of Hydrogen Energy, 35, 577-584 (2010).

261. "Transport Characteristics of Dehydrogenated Ammonia Borane and Sodium Borohydride Spent Fuels," S. Basu, M. Diwan, M. G. Abiad, Y. Zheng, O.H. Campanella and A. Varma, International Journal of Hydrogen Energy 35, 2063-2072 (2010).

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

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

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

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

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

267. "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, International Journal of Hydrogen Energy, 37, 2407-2411 (2012).

268. "High and Rapid Hydrogen Release from Thermolysis of Ammonia Borane near PEM Fuel Cell Operating Temperatures: Effect of Quartz Wool," H.T. Hwang, A. Al-Kukhun and A. Varma, International Journal of Hydrogen Energy, 37, 6764-6770 (2012).

269. "Preparation of Highly Superacidic Sulfated Zirconia via Combustion Synthesis and its Application in Pechmann Condensation of Resorcinol with Ethyl Aceoacetate," G. D. Yadav, N. P. Ajgaonkar and A. Varma, Journal of Catalysis, 292, 99-110 (2012).

270. "NbF_5 Additive Improves Hydrogen Release from Magnesium Borohydride," A. Al-Kukhun, H. T. Hwang and A. Varma, International Journal of Hydrogen Energy, 37, 17671-17677 (2012).

271. "Mechanistic Studies of Ammonia Borane Dehydrogenation," A. Al-Kukhun, H. T. Hwang and A. Varma, International Journal of Hydrogen Energy, 38, 169-179 (2013).

272. "Oxidative Coupling of Methane Using Catalysts Synthesized by Solution Combustion Method," R. Ghose, H. T. Hwang and A. Varma, Applied Catalysis A: General, 452, 147-154 (2013).

273. "Effect of Boric Acid on Thermal Dehydrogenation of Ammonia Borane: Mechanistic Studies," H. T. Hwang and A. Varma, International Journal of Hydrogen Energy, 38, 1925-1931 (2013).

This article was selected to appear on "Renewable Energy Global Innovations" website: http://reginnovations.org/key-scientific-articles/effect-of-boric-acid-on-thermal-dehydrogenation-of-ammonia-borane-mechanistic-studies/

274. "Effect of Boric Acid on Thermal Dehydrogenation of Ammonia Borane: H 2 yield and Process Characteristics," H. T. Hwang, P. Greenan, S.-J. Kim and A. Varma, AIChE Journal - Founder's Tribute issue in honor of the late Professor Neal R. Amundson, 59, 3359-3364 (2013).

275. "A Universal Procedure for Crude Glycerol Purification from Different Feedstock in Biodiesel Production: Experimental and Simulation Study," Y. Xiao, G. Xiao and A. Varma, Industrial & Engineering Chemistry Research, 52, 14291-14296 (2013).

276. "Kinetic Study of Biphasic Aldol Condensation of n-Butyraldehyde using Stirred Cell," S.B. Lee and A. Varma, Chemical Engineering Science, 104, 619-629 (2013).

277. “Oxidative Coupling of Methane using Catalysts Synthesized by Solution Combustion Method: Catalyst optimization and kinetic studies,” R. Ghose, H. T. Hwang and A. Varma, Applied Catalysis A: General, 472, 39-46 (2014).

278. “Review: Lipase-Catalyzed Process for Biodiesel Production: Protein engineering and lipase production,” H.T. Hwang, F. Qi, C. Yuan, X. Zhao, D. Ramkrishna, D. Liu and A. Varma, Biotechnology and Bioengineering, 111, 639-653 (2014).

279. “Hydrodynamics of Trickle Bed Reactors with Catalyst Support Particle Size Distributions,” G. Honda, P. Gase, D. Hickman and A. Varma, Industrial & Engineering Chemistry Research, 53, 9027-9034 (2014).

280. “Conversion of Guaiacol on Noble Metal Catalysts: Reaction performance and deactivation studies,” D. Gao, C. Schweitzer, H. T. Hwang and A. Varma, Industrial & Engineering Chemistry Research, 53, 18,658-18,667 (2014).

281. “Hydrogen Storage for Fuel Cell Vehicle Applications,” H. T. Hwang and A. Varma, Current Opinion in Chemical Engineering, 5, 42-48 (2014).

282. “Perspective Article: Evolving Trends in Chemical Engineering Education,” A. Varma and I. E. Grossmann, AIChE Journal, 60, 3692-3700 (2014).

283. “Aldol Condensation of n-Butyraldehyde in a Biphasic Stirred Tank Reactor: Experiments and Models,” S.B. Lee and A. Varma, AIChE Journal, 61, 2228-2239 (2015).

284. "Effects of Pre-Wetting on Bubbly and Pulsing Flow Regime Transitions in Trickle-Bed Reactors,” G. Honda, E. Lehmann, D. Hickman and A. Varma, Industrial & Engineering Chemistry Research, 54, 10253-10259 (2015).

285. “Engineering surface hydrophobicity improves activity of Bacillus thermocatenulatus lipase 2 enzyme,” T. Tang, C. Yuan, H.T. Hwang, X. Zhao, D. Ramkrishna, D. Liu and A. Varma, Biotechnology Journal, 10, 1762–1769 (2015).

286. “The Value of an Industrial Internship for a Graduate Student Education,” G. S. Honda, J. Pazmino, D. A. Hickman, and A. Varma, Chemical Engineering Education, 49 (4), 195-200 (2015).

287. “Catalytic Deoxygenation of Guaiacol Using Methane,” Y. Xiao and A. Varma, ACS Sustainable Chemistry & Engineering, 3, 2606−2610 (2015).

288. “Guaiacol Hydrodeoxygenation over Platinum Catalyst: Reaction Pathways and Kinetics,” D. Gao, Y. Xiao and A. Varma, Industrial & Engineering Chemistry Research, 54, 10638−10644 (2015).

289. “Hydrogen Storage Methods for Fuel Cell Vehicles: Current Status,” H.T. Hwang and A. Varma, Reference Module in Chemistry, Molecular Sciences and Chemical Engineering, J. Reedijk (Ed.), Elsevier, Waltham, MA, ISBN: 978-0-12-409547-2; doi: 10.1016/B978-0-12-409547-2.11132-1 (2015).

290. “The Effects of Particle Properties, Void Fraction, and Surface Tension on the Trickle-Bubbly Flow Regime Transition in Trickle Bed Reactors,” G. S. Honda, J. H. Pazmino, E. Lehmann, D. A. Hickman and A. Varma, Chemical Engineering Journal, 285, 402–408 (2016).

291. “Acetophenone Hydrogenation on Rh/Al2O3 Catalyst: Intrinsic Reaction Kinetics and Effects of Internal Diffusion,” S.B. Lee, Z. Yu, N. Zaborenko and A. Varma, Chemical Engineering Journal, 288, 711–723 (2016).

292. "Kinetic Study of Pd-Catalyzed Hydrogenation of N-Benzyl-4-Fluoroaniline," H.T. Hwang, J. R. Martinelli, R. Gounder and A. Varma, Chemical Engineering Journal, 288, 758–769 (2016).

293. "Chemical Engineering at Purdue University," A. Varma and C. Farmus, Chemical Engineering Education, 50 (3), 154-160 (2016).

294. "Solution Combustion Synthesis of Nanoscale Materials," A. Varma, A.S. Mukasyan, A.S. Rogachev and K.V. Manukyan, Chemical Reviews, 116 (23), 14493-14586 (2016). Note: A graphic from this article was selected for the cover image.

295. "Conversion of Glycerol to Hydrocarbon Fuels via Bifunctional Catalysts," Y. Xiao and A. Varma, ACS Energy Letters, 1, 963-968 (2016).

296. "An Experimental and Theoretical Study of Glycerol Oxidation to 1,3-Dihydroxyacetone over Bimetallic Pt-Bi Catalysts," Y. Xiao, Z.J. Zhao, J. Greeley, G. Xiao and A. Varma,

297. "Kinetics of Guaiacol Deoxygenation Using Methane over Pt-Bi Catalyst," Y. Xiao and A. Varma, Reaction Chemistry & Engineering, 2, 36-43 (2017).

298. "Acetophenone Hydrogenation on Rh/Al2O3 Catalyst: Flow Regime Effect and Trickle Bed Reactor Modeling," S.B. Lee, N. Zaborenko and A. Varma, Chemical Engineering Journal, 317, 42–50 (2017).

299. "Tailored Solution Combustion Synthesis of High Performance ZnCo2O4 Anode Material for Lithium-ion Batteries," R. Adams, V. G. Pol and A. Varma, Industrial & Engineering Chemistry Research, 56, 7173–7183 (2017).

300. "MXenes as Promising K-ion Battery Anodes," M. Naguib, R. Adams, Y. Zhao, A. Varma, J. Nanda and V. G. Pol (in review).

301. "Binder-free, N- and O- Rich Carbon Nanofiber Anodes for Long Cycle Life K-ion Batteries," R. Adams, J.-M. Syu, Y. Zhao, C.-T. Lo, A. Varma and V. G. Pol, ACS Applied Materials & Interfaces, 9, 17872−17881 (2017).

302. "Electrochemical Performance of MXenes as K-ion Battery Anodes," M. Naguib, R.A. Adams, Y. Zhao, D. Zemlyanov, A. Varma, J. Nanda and V. G. Pol, Chemical Communications, 53, 6883-6886 (2017).

303. "Kinetics of Glycerol Conversion to Hydrocarbon Fuels over Pd/H-ZSM-5 Catalysts," Y. Xiao and A. Varma, AIChE Journal, 63, 5445-5451 (2017).

304. "Hydrogen Generation from Hydrous Hydrazine over Ni/CeO_2 Catalysts Prepared by Solution Combustion Synthesis," W. Kang, and A. Varma, Applied Catalysis B: Environmental, 220, 409-416 (2018).

305. "Mechanistic Elucidation of Thermal Runaway in Potassium-Ion Batteries," R. Adams, A. Varma and V. G. Pol, Journal of Power Sources, 375, 131-137 (2018).

306. "Highly Selective Non-Oxidative Coupling of Methane over Pt-Bi Bimetallic Catalysts," Y. Xiao and A. Varma, ACS Catalysis, 8, 2735-2740 (2018).

307. "Solution Combustion Synthesis of High Surface Area CeO_2 Nanopowders for Catalytic Applications: Reaction Mechanism and Properties," W. Kang, D. Ozgur and A. Varma, ACS Applied Nano Materials, 1, 675-685 (2018).

308. "Low-Temperature Selective Oxidation of Methanol over Pt-Bi Bimetallic Catalysts," Y. Xiao, Y. Wang and A. Varma, Journal of Catalysis, 363, 144-153 (2018).

309. "Bio-oil Upgrading Using Methane: A mechanistic study of model compound guaiacol reactions over Pt-Bi bimetallic catalysts," Y. Xiao and A. Varma, ACS Sustainable Chemistry & Engineering, 6, 17368-17375, (2018)

310. “TMechanistic elucidation of thermal runaway in potassium-ion batteries,” R. Adams, A. Varma and V. G. Pol, Journal of Power Sources, 375, 1131-137 (2018).
311. “One-step Solution Combustion Synthesis of $CuO/Cu_2O/C$ anode for Long Cycle Life Li-Ion Batteries,” C. Xu, K. Manukyan, R. Adams, V. Pol, P. Chen and A. Varma, Carbon, Carbon, 142, 51-59 (2019).
312. “Noble-metal-free $NiCu/CeO_2$ catalysts for H_2 generation from hydrous hydrazine,” W. Kang, H. Guo and A. Varma, Applied Catalysis B: Environmental, 249, 54-62 (2019)
313. “Temperature Dependent Electrochemical Performance and Safety Aspects of Graphitic Anodes for K-ion and Li-ion Batteries,” R. Adams, A. Varma and V. G. Pol Journal of Power Sources, 410-411, 124-131 (2019).
314. “Role of Bismuth in the Stability of Pt–Bi Bimetallic Catalyst for Methane Mediated Deoxygenation of Guaiacol, an APXPS Study,” K. Roy, L. Artiglia, Y. Xiao, A. Varma and J. A. van Bokhoven, ACS Catalysis, 9, 3694-3699 (2019)
315. “Carbon Anodes for Nonaqueous Alkali Metal-Ion Batteries and Their Thermal Safety Aspects”, Adams, Ryan A. and Varma, Arvind and Pol, Vilas G. Advanced Energy Materials, 1900550 (2019)
316. “Identification of the structure of the Bi promoted Pt non-oxidative coupling of methane catalyst: a nanoscale Pt_3Bi intermetallic alloy,” J. ZhuChen, Z. Wu, X. Zhang, S. Choi, Y.Xiao, A. Varma, W. Liu, G. Zhang and J. T. Miller. Catalysis Science & Technology, 9, 1349-1356 (2019).
317. “Refinement of the Kinetic Model for Guaiacol Hydrodeoxygenation over Platinum Catalysts”, R. Lagare, Y. Xiao, L. Blanshan, and A. Varma, 2019, (In Review).
318. “Gas-Phase Full Hydrodeoxy genation of Guaiacol under Mild Conditions: enhanced aromatic selectivity over bifunctional Pt-based catalysts on acidic and mesoporous KIT-6 Supports”, Y. Xiao, A. Ramanathan, B. Subramaniam and A. Varma, 2019, (In Review).
319. Efficient and Cost-effective Hydrogen Generation from Hydrous Hydrazine Using Low Pt Loading NiPt/CeO2 Catalysts”, W. Kang, E.Walter, Y. Xiao and A. Varma, 2019, (In Review).
320. Parametric Sensitivity and Runaway in Fixed-Bed Reactors: Example of Methanol Oxidation over Pt-Bi Catalysts, Y. Xiao, R. Lagare and A. Varma, 2019, (In Review).

Other Publications

1. "Reactor Design for Complex Reactions: A Case Study," A. L. DeVera and A. Varma, *Proc. First International Conference on Mathematical Modeling*, St. Louis, MO, Xavier J. R. Avula (Editor), 1749-1757 (1977).

2. "Some Modeling and Simulation Aspects in Automotive Catalysis," C. J. Pereira, J. J. Carberry and A. Varma, *Proc. 1978 Summer Computer Simulation Conference*, 336-347 (1978).

3. Book Review of *Chemical Reactor Theory - A Review*, L. Lapidus and N. R. Amundson (Editors), Chemical Engineering Education, 13, 131 (1979).

4. "Session Summary: Process Modeling and Analysis, II-Reactors," A. Varma in *Foundations of Computer-Aided Chemical Process Design*, Volume II, R. S. H. Mah and W. D. Seider (Editors), Engineering Foundation, 431-438 (1981).

5. Book Review of *Chemical Reactor Analysis and Design,* G. F. Froment and K. B. Bischoff, Chemical Engineering Education, 17, 176 (1983).

6. Book Review of *Heterogeneous Reactions: Analysis, Examples, and Reactor Design*, L. K. Doraiswamy and M. M. Sharma, American Scientist, 74, 80 (1986).

7. Book Review of *Mass Transfer with Chemical Reaction in Multiphase Systems*, E. Alper (Editor), Chemical Engineering Education, 22, 103 (1988).

8. Book Review of *Process Modeling*, M. M. Denn, Chemical Engineering Progress, 84(6), 8 (1988).

9. "Combustion Synthesis of Oxide Superconductors," Feature article in *Supernews*, Indiana Center for Innovative Superconductor Technology (ICIST), Spring 1991.

10. Book Review of *Chemical Oscillations and Instabilities: Non-linear Chemical Kinetics*, P. Gray and S. K. Scott, Chemical Engineering Education, 28, 16 (1994).

11. "A Comparison between Uniform and Nonuniform Catalyst Distribution for Inorganic Membrane Reactors," J. Szegner, G. Cao and A. Varma, *International Synposium on Synthetic Membranes in Science and Industry-Symposium Handbook*, Dechema, Frankfurt, 402-405 (1994).

12. "On the Velocity of the Combustion Front during Self-Propagating High-Temperature Synthesis," G. Cao and A. Varma, *New Horizons for Materials*, P. Vincenzini (Editor), Techna Srl, 177-184 (1995).

13. "The Effect of Gravity on the Combustion Synthesis of Ni-Al and Ni_3Al-TiB_2 Composites from Elements," A. Varma, H. C. Yi and P. J. McGinn, *Proceedings of the Third International Microgravity Combustion Workshop*, NASA Lewis Research Center, Cleveland, OH, 181-186 (1995).

14. "Membrane Synthesis and Catalyst Distribution Studies for Ethane Dehydrogenation in Microporous Alumina Membrane Reactors," J. Szegner, K.L. Yeung and A. Varma, *Preceedings of the Fourth International Conference on Inorganic Membranes*, Gatlinburg, TN (1996).

15. "Metal Composite Membranes: Synthesis, Characterization and Reaction Studies," K.L. Yeung, J. Szegner and A. Varma, *Proceedings of the 5th World Congress in Chemical Engineering*, 3, 282-287 (1996).

16. "Microporous Ceramic Membranes: Synthesis, Characterization and Reaction Studies," J. Szegner, K.L. Yeung and A. Varma, *Proceedings of the 5th World Congress in Chemical Engineering*, 4, 945-949 (1996).

17. "Mechanistic Studies in Combustion Synthesis of Advanced Materials," A. Varma, *Proceedings of the 5th World Congress in Chemical Engineering*, 4, 7-12 (1996).

18. "Synthesis of Reaction-Bonded Silicon Nitride: Experiments and Theory," M. Maalmi, A. Varma and W. Strieder, *Proceedings of the 5th World Congress in Chemical Engineering*, 5, 67-72 (1996).

19. "Mechanistic Studies in Combustion Synthesis of Advanced Materials," *Advances in Chemical Engineering,* Invited Lectures of the International Conference on Advances in Chemical Engineering, IIT-Madras, 99-104 (1996).

20. "The Effects of Gravity on Combustion and Structure Formation during Combustion Synthesis in Gasless Systems," *Proceedings of the Fourth International Microgravity Combustion Workshop,* NASA-Lewis, Cleveland, OH, 31-36 (1997).

21. "Arvind Varma of Notre Dame," Chemical Engineering Education, 32 (1), 2-7 (1998).

22. "Effect of Pulsing on Reaction Outcome in a Gas-Liquid Catalytic Packed-Bed Reactor," R. Wu, M.J. McCready and A. Varma, *Proceedings of the 2nd International Symposium on Catalysis in Multiphase Reactors*, Toulouse, France, 263-267 (1998).

23. "The Effects of Gravity on Combustion and Structure Formation during Synthesis of Advanced Materials," A. Varma, A. Pelekh, and A.S. Mukasyan, *Proceedings of the Fifth International Microgravity Combustion Workshop*, NASA Glenn Research Center, Cleveland, OH, 421-423 (1999).

24. "Mechanistic Studies of Combustion and Structure Formation During Synthesis of Advanced Materials," A. Varma, C. Lau and A. S. Mukasyan, *Proceedings of the Sixth International Microgravity Combustion Workshop*, NASA Glenn Research Center, Cleveland, OH, 277-280 (2001).

25. "Combustion of Levitated Clad Al/Ni Particles," E. Shafirovich, A.S. Mukasyan, A. Varma, B. Legrand, C. Chauveau and I. Gokalp, *Proceedings of the 2nd Joint U.S. Sections Meeting of The Combustion Institute* (on CD), Oakland, CA (2001).

26. "In Memoriam: James J. Carberry, 1925-2000," M. Boudart and A. Varma, Catalysis Reviews, 43, v (2001).

27. "Combustion of Low-Exothermic Condensed Systems for Oxygen Generation," E. Shafirovich, A.S. Mukasyan, A. Varma, G. Kshirsagar, Y. Zhang and J.C. Cannon, *Proceedings of 2002 Spring Technical Meeting of the Central States Section of The Combustion Institute* (on CD), Knoxville, TN (2002).

28. "Mechanistic Studies of Combustion and Structure Formation during Synthesis of Advanced Materials," A. Varma, C. Lau and A.S. Mukasyan, *Proceedings of the 40th AIAA Aerospace Sciences Meeting* (AIAA 2002-1079, on CD), Reno, NV (2002).

29. "Combustion Synthesis of Bio-Alloys: Phase Separation Mechanism," A. Varma, C. Lau and A.S. Mukasyan, *Proceedings of the 41st AIAA Aerospace Sciences Meeting* (AIAA 2003-0984, on CD), Reno, NV (2003).

30. "Combustion of Complex Metal Particles," A. Varma and A.S. Mukasyan, *Proceedings of the 3rd Joint U.S. Sections Meeting of The Combustion Institute* (on CD), Chicago, IL (2003).

31. "Future Directions in Chemical Engineering Education: A New Path To Glory," A. Varma, Conoco Phillips Lecture brochure, Oklahoma State University, Stillwater, OK (2003).

32. "Mechanistic Studies of Combustion and Structure Formation During Combustion Synthesis of Advanced Materials: Phase Separation Mechanism for Bio-Alloys," A. Varma, C. Lau and A. S. Mukasyan, *Proceedings of the Seventh International Microgravity Combustion Workshop*, NASA Glenn Research Center, Cleveland, OH, 65-68 (2003).

33. "Nickel-Coated Aluminum Particles: A Promising Fuel for Mars Missions," E. Shafirovich and A. Varma, *Strategic Research to Enable NASA's Exploration Missions Conference and Workshop*, Cleveland, OH, NASA/CP-2004-213205/VOL2, 366-376 (2004).

34. "Combustion of Condensed Systems for Oxygen and Hydrogen Generation," Shafirovich, E., Diakov, V., and Varma, A., *Proceedings of the 4th Joint U.S. Sections Meeting of the Combustion Institute* (on CD), Philadelphia, PA (2005).

35. "Hydrogen Generation via Combustion of Metal Borohydride/Aluminum/Water Mixtures," Shafirovich, E., Diakov, V., and Varma, A., *Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry* Vol. 50(2), 450-451 (2005).

36. "Studies on Ignition and Combustion Mechanisms of Single Ni-Coated Al Particles," T. Andrzejak, E. Shafirovich, D. Taylor and A. Varma, *Proceedings of the 44th AIAA Aerospace Sciences Meeting* (AIAA 2006-1130, on CD), Reno, NV (2006).

37. "Novel Chemical Mixtures for Hydrogen Generation by Combustion," E. Shafirovich, V. Diakov and A. Varma, *Proceedings of the 44th AIAA Aerospace Sciences Meeting* (AIAA 2006-1445, on CD), Reno, NV (2006).

38. "Ignition and Combustion Mechanisms of Nickel-Coated Aluminum Particles," T.A. Andrzejak, E. Shafirovich, D. Taylor and A. Varma, *2006 Technical Meeting of the Central States Section of the Combustion Institute, Cleveland, OH*, May 2006, on CD.

39. "Combustion of Single Titanium and Coated Aluminum Particles," T.A. Andrzejak, E. Shafirovich, S.K. Teoh and A. Varma, Paper # G20, *5th US Combustion Meeting, San Diego, CA*, March 2007.

40. "Combustion of Borohydride/Metal/Water Mixtures for Hydrogen Generation," M. Diwan, E. Shafirovich, V. Diakov and A. Varma, Paper # F34, *5th US Combustion Meeting, San Diego, CA*, March 2007.

41. Diwan, M., Diakov, V., Shafirovich, E., and Varma, A., "Hydrogen Generation for Portable Fuel Cells by Using Novel Chemical Mixtures," Preprints of Symposia - American Chemical Society, Division of Fuel Chemistry Vol. 52(2), 2007, pp. 790-791.

42. Shafirovich, E., and Varma, A., "Metal-CO2 Propulsion for Mars Missions: Current Status and Opportunities," 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference, July 8-11, 2007, Cincinnati, OH, AIAA Paper 2007-5126.

43. Andrzejak, T.A., Shafirovich, E., and Varma, A., "Ignition of Aluminum Particles Coated by Nickel or Iron: Studies under Normal and Reduced Gravity Conditions," 43rd AIAA/ASME/SAE/ASEE Joint Propulsion Conference, July 8-11, 2007, Cincinnati, OH, AIAA Paper 2007-5646.

44. "Arvind Varma: Educator, Researcher and Leader," M. Morbidelli and B. Subramaniam, Arvind Varma Festchrift, Industrial & Engineering Chemistry Research, 47, 8957-8959 (2008).

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

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

47. “Neal R. Amundson, 1916-2011,” D. Luss and A. Varma, Memorial Tributes – National Academy of Engineering, 15, 21-23 (2011).

48. “Preface: Doraiswami Ramkrishna—Dedicated to the Application and Teaching of Mathematics in Chemical Engineering,” Industrial & Engineering Chemistry Research, 54, 10135–10137 (2015).

Intellectual Property

1. “Synthesis of Orthopaedic Implant Materials,” A. Varma, A.S. Mukasyan and B. Li, U.S. Patent 6,896,846, issued May 24, 2005.

2. "System and Method for Generating Hydrogen," E. Shafirovich, V. Diakov and A. Varma, Provisional Patent Application filed on March 18, 2005; US Patent Application filed on March 9, 2006; US Patent Application Publication No. 2006/0210470, date Sep 21, 2006.

3. “Method for Releasing Hydrogen from Ammonia Borane,” A. Varma, M. Diwan and E. Shafirovich, Provisional Patent Application No. 60/957,111 filed on August 21, 2007; US Patent Application 12/544,832, filed on August 20, 2009; US Patent Application Publication No. 2010/0047159, date Feb 25, 2010.

4. “Method to Generate Hydrogen for Portable Fuel Cell Systems,” M. Diwan, E. Shafirovich and A. Varma, Provisional Patent Application No. 61/143,191, filed on January 8, 2009.

5. “Ammonia Removal for Hydrogen PEM Fuel Cells,” A. Al-Kukhun, H.T. Hwang and A. Varma, Provisional Patent Application No. 61/530,420 filed on September 2, 2011.

6. “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, Provisional Patent Application No. 61/534,913, filed on September 15, 2011.

7. “High and Rapid Hydrogen Release from Thermolysis of Ammonia Borane at PEM Fuel Cell Temperature Using Boric Acid as Additive,” H.T. Hwang and A. Varma, Invention Disclosure, filed on November 9, 2011.

8. “Method to Prevent Reprocessing of Ammonium Nitrate Based Compounds into Element of Explosives,” H.T. Hwang and A. Varma, Invention Disclosure, filed on January 20, 2012.

9. “Hydrogen Release from Magnesium Borohydride with Additives,” A. Al-Kukhun, H.T. Hwang and A. Varma, Invention Disclosure, filed on March 30, 2012.

10. “Oxidative Coupling of Methane using Catalysts Synthesized by Solution Combustion Method,” R. Ghose, H.T. Hwang and A. Varma, Provisional Patent Application No. 61/684,942, filed on August 20, 2012.

11. “High and rapid hydrogen release from thermolysis of ammonia borane near pem fuel cell operating temperatures and ammonia removal for hydrogen pem fuel cells”, A. Varma, Arvind, H.T. Varma, and A. Al-Kukhun, US201161534913P, filed on Sept. 2, 2012.

12. Yang Xiao and Arvind Varma, “Non-oxidative Production of Hydrocarbon from Methane”, US20190084904A1, September 19, 2018.

13. “Method of Conversion of Glycerol to Hydrocarbon Fuels”, Y. Xiao and A. Varma, US20190153329A1, October 3, 2018.

14. “Method of Producing Formaldehyde from Methanol”, Y. Xiao and A Varma, US20190194106A1, December 19, 2018.

15. “Catalytic Deoxygenation of Bio-Oils Using Methane”, Y. Xiao and A. Varma, US10023809 B2, July 17, 2018.

16. “Method of Enhanced Aromatic Products from Bio-oil Upgrading”, Y. Xiao, A. Varma, A. Ramanathan, and B. Subramaniam, Provisional Patent 62865209, June 22, 2019.