James Nathaniel Michaels, Ph.D.

Professor of Practice of Chemical & Biomolecular Engineering
Co-Director of the Master of Engineering in Particle Technology Program

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PROFESSIONAL INTERESTS

I am currently Co-Director of the University of Delaware's new Master of Engineering in Particle Technology (MEPT) program. I share responsibility with a faculty associate for all aspects of the program including curriculum development, teaching, recruiting, admissions, and industrial relations. At the time of my retirement from Merck in 2014, I had established and directed an industry leading center of excellence in materials science and particle technology, supporting all product sectors, including small molecules, vaccines and biologics, sterile products, consumer care, and animal health. In addition, I had a 20-year association with the International Fine Particle Research Institute (IFPRI). I hold nine U.S. Patents, am the author of fifty publications, and was the recipient of numerous awards, including the Presidential Young Investigator Award from the National Science Foundation.

EDUCATION

Massachusetts Institute of Technology 1983
Department of Chemical Engineering, Degree: Sc.D.

Imperial College of Science and Technology, University of London 1978
Department of Physical Chemistry, Diploma

University of California at Berkeley 1977
Department of Chemical Engineering, Degree: M.S.

University of California at Berkeley 1976
Department of Chemical Engineering, Degree: B.S.

EXPERIENCE

Professor of Practice 2014-present
Chemical & Biomolecular Engineering, University of Delaware, Newark

Co-Director, Master of Engineering in Particle Technology Program 2014-present
Chemical & Biomolecular Engineering, University of Delaware, Newark

Vice-President, Academic-Industrial Liaison 2013-present
International Fine Particle Research Institute, Wilmington, Delaware

Scientific Associate Vice-President 2012-2014
Center for Material Science and Engineering (CMSE)
Merck & Company, Inc., Manufacturing Division, West Point, Pennsylvania

Senior Scientific Director 2006-2012
Center for Material Science and Engineering (CMSE)
Merck & Company, Inc., Manufacturing Division, West Point, Pennsylvania

Distinguished Scientist 1999-2006
Pharmaceutical Materials Laboratory (PCML)
Merck & Company, Inc., Manufacturing Division, West Point, Pennsylvania

Director 1997-1999
Pharmaceutical Materials Laboratory (PCML)
Merck & Company, Inc., Manufacturing Division, West Point, Pennsylvania

Associate Director and Senior Fellow 1993-1997
Pharmaceutical Materials Laboratory (PCML)
Merck & Company, Inc., Manufacturing Division, West Point, Pennsylvania

Senior Research Engineer 1990-1993
Central Research Laboratory
Mobil Research and Development Corporation, Princeton, New Jersey

Associate Professor 1983-1989
Department of Chemical Engineering
University of California, Berkeley, Berkeley, California

PROFESSIONAL AWARDS

Presidential Young Investigator Award 1986
National Science Foundation

Halcon Fellow 1979
Massachusetts Institute of Technology, Department of Chemical Engineering

Graduate Fellow of Rotary International 1978

Sigma Xi Research Honor Society 1977
University of California, Berkeley

Tau Beta Pi Engineering Honor Society 1976
University of California, Berkeley

Phi Beta Kappa Academic Honor Society 1976
University of California, Berkeley

PROFESSIONAL AFFILIATIONS

University of Leeds
Advisory Board
EPSRC Centre for Doctoral Training in Complex Particulate Products and Processes

The City College of the City University of New York
Advisory Board
Department of Chemical Engineering

University of Massachusetts
Advisory Board
Department of Chemical Engineering

Powder Technology
Editorial Board

American Institute of Chemical Engineers (AIChE)

U. S. PATENTS

1. "Fuel Cell and Method for Conducting Gas-Phase Oxidation", **U.S. Patent No. 4,463,065**, July 31, 1984, with L.L. Hegedus and C.G. Vayenas

2. "Electrocatalytic Energy Conversion and Chemicals Production", **U.S. Patent No. 4,643,806**, Feb. 17, 1987, with L.L. Hegedus and C.G. Vayenas

3. "Process for Oxidative Conversion of Methane to Higher Hydrocarbons Using Metal Sulfide Oxidizing Agent", **U.S. Patent No. 5,191,138**, Mar. 23, 1993, with S. Han, R.E. Palermo, D.L. Stern, and D.E. Walsh

4. “Process for the Catalytic Dehydrogenation of Alkanes to Alkenes with Simultaneous Combustion of Hydrogen”, **U.S. Patent No. 5,430,209**, July 4, 1995, with P.A. Agaskar, R.K.Grasselli, P.T. Reischman, D.L. Stern, and J.G. Tsikoyiannis

5. “Process for the Catalytic Dehydrogenation of Alkanes to Alkenes with Simultaneous Combustion of Hydrogen”, **U.S. Patent No. 5,527,979**, June 18,

1996, with P.A. Agaskar, R.K.Grasselli, P.T. Reischman, D.L. Stern, and J.G. Tsikoyiannis

6. “Process for the Catalytic Dehydrogenation of Alkanes to Alkenes with Simultaneous Combustion of Hydrogen”, **U.S. Patent No. 5,530,171**, June 25, 1996, with P.A. Agaskar, R.K.Grasselli, P.T. Reischman, D.L. Stern, and J.G. Tsikoyiannis

7. “Process for the Catalytic Dehydrogenation of Alkanes to Alkenes with Simultaneous Combustion of Hydrogen”, **U.S. Patent No. 5,563,314**, Oct. 8, 1996, with P.A. Agaskar, R.K.Grasselli, P.T. Reischman, D.L. Stern, and J.G. Tsikoyiannis

8. “Polymorphic Form of Montelukast Sodium”, **International Patent No. WO/2004/091618 A1**, October 28, 2004, with J-H. Chou, M.B. Gentzler, M.G. Wu, C. Bazin, S-D. Clas, and C. Dalton

9. "Polymorphic Form of Montelukast Sodium", **U.S. Patent No. 7,560,559**, July 14, 2009, with J-H. Chou, M.B. Gentzler, M.G. Wu, C. Bazin, S-D. Clas, and C. Dalton

PUBLICATIONS IN PRINT

1. "Solvent Properties of Organic Bases for Extraction of Acetic Acid from Water", J. Sep. Process Technol., 1(1), 36-41,(1979), with N.L. Ricker and C.J. King

2. "Kinetics and Mechanism of the Ethylene Oxidation on Platinum", J. Catal., 66(1), 36-48 (1980), with C.G. Vayenas and B. Lee

3. "The Role of a Platinum Oxide in the Isothermal Rate Oscillations of Ethylene Oxidation on Platinum", J. Catal., 67(2), 348-361 (1981), with C.G. Vayenas, C. Georgakis, and J. Tormo

4. "Response to 'Comment on the Model for Isothermal Oscillations of Ethylene Oxidation on Platinum'", J. Catal., 73(1), 201-204 (1982), with C. Vayenas and C. Georgakis

5. "On the Stability Limit of Surface Platinum Oxide and Its Role in Ocillation Phenomena of Platinum-Catalyzed Oxidations", Surf. Sci., 120, L405-L408 (1982), with C.G. Vayenas

6. "Kinetics of Vapor-Phase Electrochemical Oxidative Dehydrogenation of Ethylbenzene", J. Catal., 85, 477 (1984) with C.G. Vayenas

7. "Styrene Production from Ethylbenzene in a Zirconia Electrochemical Reactor", J. Electrochem. Soc., 131(11), 2544 (1984), with C.G. Vayenas

8. "A Novel Cross Flow Design for Solid-State Electrochemical Reactors", J. Electrochem. Soc., 133, 522 (1986), with L.L. Hegedus and C.G. Vayenas

9. "Carbon and Oxygen Atom Mobility During Activation of Mo_2C Catalysts", J. Catal., 101, 301 (1986), with K.J. Leary and A.M. Stacy

10. "Surface Diffusion Limited Oxygen Exchange in Zirconia Electrochemical Cells", AIChE Symp. Ser. 254, 83, 56 (1987) with N.L. Robertson

11. "The Effect of Subsurface Diffusion on the TPR Spectra of Oxygen on Mo_2C", J. Catal., 107, 393 (1987) with K.J. Leary and A.M. Stacy

12. "The Use of Temperature Programmed Desorption to Study the Removal of Oxygen from the $YBa_2Cu_3O_7$ Superconductor", Mat. Lett., 5(9), 357-359 (1987), with S.W. Keller, K.J. Leary, and A.M. Stacy

13. "Observation of an Oxygen Isotope Shift in the Superconducting Transition Temperature of $La_{1.85}Sr_{0.15}CuO_4$", Phys. Rev. Lett., 59(8), 915-918, with T.A. Faltens, W.K. Ham, S.W. Keller, K.J. Leary, A.M. Stacy, H-C. zur Loye, D.E. Morris, T.W. Barbee, L.C. Bourne, M.L. Cohen, S. Hoen, and A. Zettl

14. "Temperature Programmed Desorption: Multisite and Subsurface Diffusion Models", AIChE J., 34(2), 263-271 (1987) with K.J. Leary and A.M. Stacy

15. "Superconductivity in $YBa_2Cu_3O_X$ for X Greater than 7.0", ACS Symposium Series 351, 114-120 (1987), with S.W. Keller, K.J. Leary, T.A. Faltens, and A.M. Stacy

16. "Chemical Vapor Deposition of Zirconium Oxide on Porous Substrates", Solid State Ionics, 25, 207-216 (1987), with M.F. Carolan

17. "Observation of An Oxygen Isotope Effect in $YBa_2Cu_3O_7$", Phys. Rev. Lett., 59(11), 1236-1239 (1987), with K.J. Leary, H-C. zur Loye, S.W. Keller, T.A. Faltens, W.K. Ham,and A.M. Stacy

18. "Oxygen Isotope Effect in High-T_c Oxide Superconductors", Science, 238, 1558-1560 (1988), with H-C. zur Loye, K.J. Leary, S.W. Keller, W.K. Ham, T.A. Faltens, and A.M. Stacy

19. "Multiple Charge-Transfer Reactions in Zirconia Electrolytic Cells: NO_X Reduction on Platinum", J. Electrochem. Soc., 135, 1294 (1988) ,with M.A. Gessner and S.G. Nagy

20. "Growth Rates and Mechanism of Electrochemical Vapor Deposited Yttria Stabilized Zirconia Films", Solid State Ionics, 37, 189-195 (1990), with M.F. Carolan

21. "Morphology of Electrochemical Vapor Deposited Yttria Stabilized Zirconia Thin Films", Solid State Ionics, 37, 197-202 (1990), with M.F. Carolan

22. "Penetration of Hydrogen into Subsurface Sites of a Pd/SiO_2 Catalyst During Temperature Programmed Desorption", Langmuir, 4, 1251 (1988), with K.J.Leary and A.M. Stacy

23. "Partial Oxygen Isotope Substitution in $YBa_2Cu_3O_7$: Evidence for Inhomogeneities and their Effect on T_c", J. Mater. Research, 4, 504-513 (1989), with W.K. Ham, S.W. Keller, A.M. Stacy, R. Fleming, D. Hodul, and D. Krillov

24. "Oxygen Exchange on Platinum Electrodes in Zirconia Cells: Location of Electrochemical Reaction Sites", J. Electrochem. Soc., 137(1), 129-135 (1990) with N.L. Robertson

25. "Preparation of High Surface Area Transition Metal Nitrides: Mo_2N and MoN", Chemistry of Materials, 2(2), 150-157 (1990), with C.H. Jaggers and A.M. Stacy

26. "Hydrodenitrogenation Chemistry 2: Gas Phase HDN of Reactions of Polynuclear Heteroaromatic Nitrogen Compounds and Selected Intermediates over 50% Nickel Oxide/Aluminate Supported on Silica-Alumina, J. Catal., 123, 74-85 (1990), with R.H. Fish, R.S. Moore, and H. Heinemann

27. "A Compact, High Temperature NMR Probe for Use in a Narrow-Bore Superconducting Magnet", Rev. Sci. Intrum., 61(11), 3368-3371 (1990), with S.B. Adler and J.A. Reimer

28. "Double Layer Capacitance of Porous Platinum Electrodes in Zirconia Electrochemical Cells", J. Electrochem. Soc., 138(5), 1494-1499 (1991), with N.L. Robertson

29. "Pressure, Temperature, and Product Yield Relationships in Direct Methane Conversion at Elevated Pressures and Moderate Temperatures", I&EC Research, 31, 2422-2425 (1992), with D.E. Walsh, D.J. Martenak, S. Han, R.E. Palermo, and D.L. Stern

30. “Process for the Catalytic Dehydrogenation of Alkanes to Alkenes with Simultaneous Combustion of Hydrogen, Journal of Cleaner Production”, 4(3-4), 243 (1996) with P.A. Agaskar, R.K. Grasselli, P.T. Reischman, D.L. Stern and J.G. Tsikoyiannis

31. “Oxydehydrogenation of n-butane over Promoted Mg-V-oxide Based Catalysts”, Applied Catalysis A: General, 153(1-2), 21-30 (1997), with R.K. Grasselli, D.L. Stern, and L. DeCaul

32. “Effect of Primary Particle Size on Granule Growth and Endpoint Determination in High-Shear Wet Granulation”, Powder Technology, 108, 32-45 (2000), with M. Mackaplow and L.A. Rosen

33. “Liquid Distribution in Wet Granulation. Dimensionless Spray Flux”, Powder Technology, 114, 32-39 (2001), with J.D. Litster, K. Hapgood, K. Kameneni, T. Hsu, A. Sims, and M., Roberts

34. “Scale-up of Mixer Granulators for Effective Liquid Distribution”, Powder Technology, 124, 272-280 (2002), with J.D. Litster, K. Hapgood, A. Sims, M. Roberts, and K. Kameneni

35. “A Method to Quantitatively Describe Powder Segregation During Discharge From Vessels”, Pharmaceutical Technology: Tableting & Granulation Yearbook, October , 2000, pp. 6-21, with A. Alexander, M. Roddy, D. Brone, and F.J. Muzzio

36. “Mechanical Properties of Agglomerates”, Powder Technology, 117, 98-112 (2001), with D. Bika and M.J. Gentzler

37. “Use of X-Ray Tomography to Study the Porosity and Morphology of Granules”, Powder Technology, 132, 57-63 (2003), with L. Farber and G. Tardos

38. “Characterization of Crystalline Drug Nanoparticles using AFM and Complementary Techniques”, Pharmaceutical Research, 20(3), 479-484 (2003), with G. Shi, L. Farber, A. Dickey, K.C. Thompson, S.D. Shelukar, P.N. Hurter, S.D. Reynolds, and M.J. Kaufman

39. “Toward Rational Design of Powder Processes”, Powder Technology, 138, 1-6 (2003)

40. “Evolution and Structure of Drying Material Bridges of Pharmaceutical Excipients: Studies on a Microscope Slide”, Chemical Engineering Science, 58, 4515-4525 (2003), with L. Farber and G. Tardos

41. “Stress Measurements in High-Shear Granulators Using Calibrated “Test” Particles: Application to Scale-Up”, Powder Technology, 140, 217-227 (2004) with G.I. Tardos, K.P. Hapgood, and O.O. Ipadeola

42. “Impact Attrition of Brittle Structured Particles at Low Velocities: Rigorous Use of a Laboratory Vibrational Impact Tester”, Chemical Engineering Science, 59, 5949-5958 (2004) with M.B. Gentzler

43. “Strength and Morphology of Solid Bridges in Dry Granules of Pharmaceutical Powders”, Powder Technology 150, 104-116 (2005) with D. Bika, G.I. Tardos, and S. Panmai

44. “Micro-mechanical Properties of Drying Material Bridges of Pharmaceutical Excipients”, International Journal of Pharmaceutics, 306(1-2), 41-55 (2005), with L. Farber and G. I. Tardos

45. “Unified Compaction Curve Model for Tensile Strength of Tablets Made by Roller Compaction and Direct Compression, International Journal of Pharmaceutics”, 346(1-2), 17-24 (2008), with L. Farber, K.P. Hapgood, X-Y Fu, R. Meyer, M-A Johnson, F. Li

46. "Agglomeration of Hydrophobic Powders via Solid Spreading Nucleation", Powder Technology, 188, 248-254 (2009), with K.P. Hapgood and L. Farber

47. "Steady States in Granulation of Pharmaceutical Powders with Application to Scale-Up", Powder Technology, 189, 295-303 (2009) with L. Farber, G.S. Wong, K. Hapgood, S.J. Heidel, J. Farabaugh, J-H Chou, G.I. Tardos

48. "Risk Management in the Pharmaceutical Product Development Process: White Paper Prepared by PhRMA Drug Product Technology Group", J. Pharm. Innov. 3, 227-248 (2008), with M.H. Hulbert, L.C. Feely, E.I. Inman, A.D. Johnson, A.S. Kearny, M. Mitchell, and E.Zour

49. "Effect of Material Properties, Boundary Conditions, and Flow Fields on the Rheology of Dense Granular Matter", AIP Conf. Proc., 1145, 587-590 (2009), with M. Kheripour Langroudi, G.I. Tardos, and P. Mort

50. "Attribute-Based Design Space: Materials-Science-Based Quality-By-Design for Operational Flexibility and Process Portability", J. Pharm. Innov. 6, 193-201 (2011), with H. Bonsignore, B Hudson-Curtis, G. Pande, H. Lin, O. Sprockel, S. Laurenz, T. Mathai, A. Sheth

INVITED PRESENTATIONS AND LECTURES

1. "The Effect of Carbon and Oxygen Mobility on the Catalytic Properties of Mo_2C", Department of Chemical Engineering, Stanford University, Dec. 10, 1986
2. "The Effect of Carbon and Oxygen Mobility on the Catalytic Properties of Mo_2C", Stauffer Chemical Co., Richmond, CA, Dec. 17, 1986
3. "Thermal Programmed Desorption Studies of Subsurface Diffusion in Unsupported and Supported Catalysts", Department of Chemical Engineering, University of Washington, May 4, 1987

4. "Oxygen Mobility in Oxide Superconductors", Department of Chemical Engineering, Tufts University, March 28, 1988
5. "Oxygen Mobility in Oxide Superconductors", Department of Chemical Engineering, Princeton University, March 30, 1988
6. "Oxygen Mobility in Oxide Superconductors", Department of Chemical Engineering, North Carolina State University, April 1, 1988
7. "Oxygen Mobility in Oxide Supercondutors", Department of Chemical Engineering, Ben Gurion University of the Negev, Be'er Sheva, Israel, June 19, 1988
8. "Oxygen Mobility in Oxide Superconductors", Department of Chemical Engineering, Technion-Israel Institute of Technology, Haifa, Israel, June 21, 1988
9. "Ionic Transport in Oxide Electrolytes and Mixed Conductors", Air Products and Chemicals Co., Allentown, Pa., August 11, 1988
10. "NO_X Reduction in Zirconia Electrolytic Cells", General Motors Research Laboratory, Warren, MI, November 14, 1988
11. "Electrochemical Vapor Deposition of Oxide Films", Department of Chemical Engineering, California Institute of Technology, Pasadena, CA May 18, 1989
12. "Electrode Kinetics in Zirconia Electrolytic Cells", AC Rochester Division, General Motors Corporation, Flint, MI, May 23, 1989
13. "Oxygen Exchange in Zirconia Cells Revisited: Electron and Hole Injection at Platinum Electrodes", Gordon Research Conference on Solid State Ionics, New London, NH, June 20, 1990
14. "Characterization of Powders, Granulations, and Tablets by Mercury Porosimetry", Fine Particle Society meeting, Chicago, IL, August 22-25, 1995 (with M.A. Petrich)
15. “Challenges and Opportunities in Solid Dosage Form Manufacture”, Department of Chemical Engineering, Lehigh University, October 18, 1995
16. “Crystallization of Indomethacin in Solid Polyethylene Glycol”, Department of Chemical Engineering, The City College of the City University of New York, October 21, 1996
18. “Optimization of Pretreatment Conditions for the Measurement of Magnesium Stearate Surface Area”, IPEC-Americas Regulatory Affairs 2nd Annual Conference, Rockville, MD, November 17, 1997
19. “Characterization of Granules”, 40th International Industrial Pharmaceutical Research and Development Conference, Merimac, WI, June 2, 1998
20. “A Chemical Engineer’s View of Wet Agglomeration Processes from Microscale to Macroscale"” Department of Chemical Engineering, University of Pennsylvania, April 2, 1999

21. “What is Control in Pharmaceutical Manufacturing?”, Control of Particulate Processes VI, Kingfisher Bay Resort, Fraser Island, Queensland, Australia September 22, 1999
22. “Research Needs in Particle Science and Technology: A Pharmaceutical Perspective”, American Institute of Chemical Engineers 1999 Annual Meeting, Dallas, TX, November 5, 1999
23. “Toward Rational Design of Powder Processes”, 4th World Congress on Particle Technology, Sydney, Australia, July 25, 2002
24. “Toward Rational Design of Powder Processes”, Department of Chemical Engineering, City College of the City University of New York, April 28, 2003
25. “Toward Rational Design of Granulation”, AAPS Pharmaceutical Technologies Summer Conference: Advances in Wet Granulation Technology for Solid Oral Dosage Forms, The National Conference Center, Lansdowne, VA, June 8, 2003
26. “One-Dimensional Scale-up of High Shear Granulation”, Particulate Processes in the Pharmaceutical Industry, Engineering Conferences International, Montreal June 26-30, 2005
27. “Scale-up of Size Enlargement Processes: A Pharmaceutical Perspective”, American Institute of Chemical Engineers Annual Meeting, Cinncinati, OH October 31-November 2, 2005
28. "Progress Toward First-Principles Design of Particle Processes at Merck, American Institute of Chemical Engineers Annual Meeting, Philadelphia, PA, November, 2008
29. "Development of Material Attribute Design Spaces for Particulate Dosage Forms, 3rd ECI Conference on Particle Processes in the Pharmaceutical Industry, Surfers Paradise, Australia, July 2011
30. “Managing Excipient Variability in Manufacturing”, NIPTE Conference on Understanding Excipient Performance – Key to Successful QbD Formulation Design, FDA Conference Center, White Oak, MD, June 2012
31. “Development of Material Attribute Design Spaces for Particulate Dosage Forms”, Department of Chemical Engineering, Purdue University, Septemer 13, 2012
32. “Fluid-like properties of Powders: Rheology in the Intermediate Flow Regime”. American Institute of Chemical Engineers Annual Meeting, Pittsburg, PA, November 2012

CONTRIBUTED PRESENTATIONS AND LECTURES

1. "The Effect of Carbon Mobility on the Catalytic Properties of Mo_2C", AIChE Annual Meeting, Miami, Nov. 5, 1986, with K.J. Leary and A.M. Stacy

2. "Surface Diffusion Limited Oxygen Exchange in Zirconia Electrochemical Cells", AIChE Annual Meeting, Miami, Nov. 6, 1986, with N.L Robertson

3. "Hydrodenitrogenation Chemistry: Rates of Product Formation, Effects of Sulfur Poisoning, and Catalyst Morphology Studies in the HDN Reaction of Model Coal Nitrogen Compounds with Nickel (2+) Oxide/Aluminate Catalyst Supported on Silica/Alumina", California Catalysis Society Spring Meeting, Berkeley, CA, March 21, 1987, with R.L. Moore, H. Heinemann, D.L. Perry, and R.H. Fish

4. "The Reaction of Ammonia with Molybdenum Trioxide, Ammonium Paramolybdate, and Diammonium Molybdate: Prepartion of High Surface Area Mo_2N and MoN", Materials Research Society Spring Meeting, Anaheim, CA, April 21, 1987, with C.H. Jaggers and A.M. Stacy

5. "The Effect of Carbon and Oxygen Mobility on the Catalytic Properties of Mo_2C", Materials Research Society Spring Meeting, Anaheim, CA, April 22, 1987, with K.J. Leary and Stacy, A.M.,

6. "Thermal Programmed Desorption Studies of Hydrogen Absorption and Diffusion in Supported Palladium", Third Joint China-Japan-United States Symposium on Catalysis, Xiamen, China, August 5-11, 1987, with K.J. Leary and A.M. Stacy

7. "The Use of Temperature Programmed Desorption to Study Subsurface Diffusion: Hydrogen in Pd/SiO_2", AIChE Annual Meeting, New York, Nov. 16, 1987, with K.J. Leary and A.M. Stacy

8. "Secondary Current Distribution in a Solid-Oxide Electrolytic Cell: Oxygen Exchange on Platinum", AIChE Annual Meeting, New York, Nov. 16, 1987, with A.L. Blank

9. "Oxygen Isotope Effect in Oxide Superconductors", MRS Fall Meeting, Boston, Dec. 2, 1987, with A.M. Stacy, W.K. Ham, S.W. Keller, K.J. Leary, and H-C. zur Loye

10. "Electrochemical Studies of the Mixed-Conductor System $YBa_2Cu_3O_{7-\_}$", MRS Fall Meeting, Boston, MA, Dec. 1, 1988, with G.F. Holland, S.L. Russek, and A.M. Stacy

11. “Optimization of the Roller Compatction Process for an Ibuprofen Formulation”, AAPS Annual Meeting, Miami, FL, Nov. 8, 1995, with J. Zega, M. McGuinness, B. Berkowicz, and D. Erb

12. “Effect of Primary particle Size on Granule Growth and Endpoint Determination in High-Shear Granulators”, Fine Powder Processing ‘97, University Park, PA, with M.B. Mackaplow and L.A. Rosen

13. “Effect of Primary particle Size on Granule Growth and Endpoint Determination in High-Shear Granulators”, American Association of Pharmaceutical Scientists Eastern Regional Meeting, New Brunswick, NJ June 9, 1997, with M.B. Mackaplow and L.A. Rosen

14. “Formation, Structure, and Strength of Solid Bridges in Granules of Pharmaceutical Materials”, AIChE Annual Meeting, Indianapolis, IN, November, 2002, with D. Bika and L. Farber

15. “Study of agglomerate / particle impact damage with a controlled resonant cantilever impactor”, AIChE Annual Meeting, Indianapolis, IN, November, 2002, with M. Gentzler

16. "Stress measurements in High Shear Granulators and implications for scale-up", AIChE Annual Meeing, San Francisco, CA, November 2003, with K. Hapgood and G. Tardos

17. “Micromechanical Properties of Model Intragranular Bridges of Pharmaceutical Excipients”, AIChE annual Meeting, Cinncinati, OH, November 2005, with L. Farber and G. Tardos

18. "Can a Design Space Be Built on Material Attributes Alone?", American Institute of Chemical Engineers Annual Meeting, Salt Lake City, UT, November 2010