

## SATISH KUMAR

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### Education

PhD, ChE, Stanford University, 1998  
Advisor: Prof. G. M. Homsy  
MS, ChE, Stanford University, 1994  
BChE, University of Minnesota, 1993

### Experience

2001-  
Department of Chemical Engineering and Materials Science  
University of Minnesota  
*Current positions:*  
Professor  
Co-leader, Coating Process Fundamentals Program, Industrial Partnership for  
Research in Interfacial and Materials Engineering  
Director of Undergraduate Studies for Chemical Engineering  
Postdoctoral Research Fellow, 1999-2000  
Department of Chemical Engineering  
University of Michigan  
Advisor: Prof. R. G. Larson  
Postdoctoral Research Fellow, 1998-1999  
Laboratoire de Physique Statistique  
Ecole Normale Supérieure (Paris, France)  
Advisor: Prof. S. Fauve

### Professional Affiliations

American Institute of Chemical Engineers  
American Physical Society  
International Society of Coating Science and Technology  
Society of Rheology

## **Professional Service Activities**

### **A. University of Minnesota**

Director of Undergraduate Studies for Chemical Engineering, Department of  
Chemical Engineering and Materials Science, 2008-  
Vice-chair, College of Science and Engineering Consultative Committee, 2010-  
Member, College of Science and Engineering (formerly Institute of Technology)  
Academic Standards and Student Affairs Committee, 2008-  
Member, College of Science and Engineering (formerly Institute of Technology)  
Curriculum Committee, 2008-  
Member, University Honors Program Faculty Advisory Board, 2009-  
Member, Astronaut Scholarship Selection Committee, 2010-  
Member, Institute of Technology Instructional Computing Committee, 2001-2009  
Member, Graduate Admissions Committee, Department of Chemical  
Engineering and Materials Science, 2002-2006  
Organizer, Fredrickson Lecture, Department of Chemical Engineering and  
Materials Science, 2002-  
Co-organizer, Seminars, Department of Chemical Engineering and Materials Science,  
Fall 2001, Fall 2003  
Advisor, AIChE Student Chapter, 2001-2008  
Co-advisor, Tau Beta Pi Chapter, 2002-2009

### **B. External**

Board of Directors, International Society of Coating Science and Technology, 2006-  
Member, Fluid Mechanics Programming Committee, American Institute of Chemical  
Engineers, 2008-  
Program chair, Fluid Mechanics sessions, 2008 Annual Meeting of the American  
Institute of Chemical Engineers  
Member, Local Organizing Committee, 2009 Annual Meeting of the American Physical  
Society Division of Fluid Dynamics  
Chair, Complex Fluids session, 2011 Annual Meeting of the American Institute of  
Chemical Engineers  
Chair, Stability and Nonlinear Hydrodynamics session, Annual Meeting of  
the American Institute of Chemical Engineers, 2004, 2009  
Chair/Co-chair, In Honor of Bud Homsey sessions I-III, 2008 Annual Meeting of the  
American Institute of Chemical Engineers

Co-chair, Non-Newtonian Flows session, 2006 Annual Meeting of the American Institute of Chemical Engineers  
Co-chair, Complex Multiphase Flows session, 2006 Annual Meeting of the American Institute of Chemical Engineers  
Co-organizer, Non-Newtonian Fluid Mechanics and Instabilities session, Annual Meeting of the Society of Rheology, 2002, 2005  
Deputy Director, Microfluidics 2003: History, Theory, and Applications, International Centre for Mechanical Sciences (Udine, Italy) Summer Module, September 2003  
Vice-chair, Stability and Nonlinear Hydrodynamics session, 2002 Annual Meeting of the American Institute of Chemical Engineers  
Presiding chair, Coating Processes session, 2011 European Coating Symposium  
Presiding co-chair, Flow and Drying of Particulate Coatings session, 15th International Coating Science and Technology Symposium, 2010  
Presiding chair, Microfluidics with Polymers session, XVth International Congress on Rheology, 2008  
Presiding chair, Interfacial and Thin Film Instabilities session, Annual Meeting of the American Physical Society Division of Fluid Dynamics, 2001-2002, 2005, 2009  
Presiding chair, Multiphase and Particle-laden Flows session, Annual Meeting of the American Physical Society Division of Fluid Dynamics, 2006  
Presiding chair, Poster Session, 14th International Coating Science and Technology Symposium, 2008  
Presiding chair, Coating Defects & Patterns session, 12th International Coating Science and Technology Symposium, 2004

Referee for Advanced Materials, Aerosol Science and Technology, AIChE Journal, Biophysical Journal, Chemical Engineering Science, Colloids and Surfaces A: Physicochemical and Engineering Aspects, Computers & Chemical Engineering, Computer Modeling in Engineering & Sciences, European Physical Journal, Europhysics Letters, Experiments in Fluids, Industrial & Engineering Chemistry Research, International Journal for Numerical Methods in Fluids, International Journal of Engineering Science, International Journal of Heat and Mass Transfer, International Polymer Processing, Journal of Adhesion Science and Technology, Journal of Biotechnology, Journal of Chemical Physics, Journal of Colloid and Interface Science, Journal of Engineering Mathematics, Journal of Fluid Mechanics, Journal of Micromechanics and Microengineering, Journal of Non-Newtonian Fluid Mechanics, Journal of Physical Chemistry, Journal of Physics D: Applied Physics, Journal of Polymer Science Part B: Polymer Physics, Journal of Rheology, Journal of the Acoustical Society of America, Langmuir, Latin American Applied Research, LWT-Food Science and Technology, Macromolecules, Molecular Simulation, Nanotechnology, Nonlinear Processes in Geophysics, Physica D, Physical Review E, Physical Review Letters, Physics of Fluids, Polymer Engineering & Science, Proceedings of the Royal Society of London: series A, Rheology Bulletin, Science, Small, SIAM Journal on Applied Mathematics, Soft Matter, Zeitschrift für Angewandte Mathematik und Physik

Reviewer for American Chemical Society Petroleum Research Fund, Department of Energy, Indian Institute of Technology, John Wiley & Sons, McGraw-Hill, National Aeronautics and Space Administration, National Science Foundation, The Royal Society

## Teaching

ChEn 4001, Material and Energy Balances, Spring 2004

ChEn 4002, Transport Phenomena, Fall 2001-2003

ChEn 4201, Numerical Methods in ChEn Applications, Spring 2005-2009

ChEn 4601, Process Control, Spring 2001-2003, Spring 2010, Fall 2010

ChEn 8101, Fluid Mechanics, Fall 2007-2009, Spring 2011-

ChEn 8301, Physical Rate Processes, Fall 2004-2006

ChEn 8902, Seminar: Finite Element Methods of Computer-aided Analysis,  
Spring 2009

Coating Process Fundamentals Short Course, University of Minnesota, 2008-

Rheological Measurements Short Course, University of Minnesota, 2004-

Microfluidics Short Course, Seoul National University, 2004

## Consulting

Remmele Engineering, 2004

Medtronic, 2007, 2009

Genome Corp., 2008

Smiths Medical, 2009

## Honors and Awards

L. E. Scriven Young Investigator Award, International Society of Coating Science and Technology, 2010

*Citation:* "The recipient is honored for outstanding sustained contributions to the mechanics of solid-fluid interactions and flow instabilities; exemplary teaching and mentoring; and distinguished service to the coating community."

Favorite Professor Award (from the undergraduate chemical engineering students at the University of Minnesota), 2002, 2003

NSF-NATO Postdoctoral Fellowship, 1998-1999

Chateaubriand Fellowship (declined)

Kodak Fellowship, 1996-1997

National Science Foundation Graduate Fellowship, 1993-1996

Tau Beta Pi

National Merit Scholarship, 1989-1993

## Publications

### A. Journal Articles

1. S. Kumar and G. M. Homsy, "Chaotic Advection in Creeping Flow of Viscoelastic Fluids between Slowly Modulated Eccentric Cylinders," *Phys. Fluids* **8**, 1774-1787 (1996).
2. S. Kumar and G. M. Homsy, "Direct Numerical Simulation of Hydrodynamic Instabilities in Two- and Three-dimensional Viscoelastic Free Shear Layers," *J. Non-Newtonian Fluid Mech.* **83**, 249-276 (1999).
3. F. Raynal, S. Kumar, and S. Fauve, "Faraday Instability with a Polymer Solution," *Eur. Phys. J. B* **9**, 175-178 (1999).
4. S. Kumar, "Parametrically Driven Surface Waves in Viscoelastic Liquids," *Phys. Fluids* **11**, 1970-1981 (1999).
5. O. Cadot and S. Kumar, "Experimental Characterization of Viscoelastic Effects on Two- and Three-dimensional Shear Instabilities," *J. Fluid Mech.* **416**, 151-172 (2000).
6. S. Kumar, "Mechanism for the Faraday Instability in Viscous Liquids," *Phys. Rev. E* **62**, 1416-1419 (2000).
7. S. Kumar and R. G. Larson, "Shear Banding and Secondary Flow in Viscoelastic Fluids between a Cone and Plate," *J. Non-Newtonian Fluid Mech.* **95**, 295-314 (2000).
8. S. Kumar and R. G. Larson, "Brownian Dynamics Simulations of Flexible Polymers with Spring-Spring Repulsions," *J. Chem. Phys.* **114**, 6937-6941 (2001).
9. S. Kumar, "Parametric Instability of a Liquid Sheet," *Proc. R. Soc. Lond. A* **457**, 1315-1326 (2001).
10. S. Kumar, "Vibration-induced Interfacial Instabilities in Viscoelastic Fluids," *Phys. Rev. E* **65**, 026305 (7 pages) (2002).
11. S. Kumar and O. K. Matar, "Parametrically Driven Surface Waves in Surfactant-covered Liquids," *Proc. R. Soc. Lond. A* **458**, 2815-2828 (2002).
12. S. Kumar and O. K. Matar, "Instability of Long-wavelength Disturbances on Gravity-modulated Surfactant-covered Thin Liquid Layers," *J. Fluid Mech.* **466**, 249-258 (2002).
13. A. S. Panwar and S. Kumar, "Brownian Dynamics Simulations of Polymer Stretching and Transport in a Complex Electro-osmotic Flow," *J. Chem. Phys.* **118**, 925-936 (2003).
14. S. Kumar, "Deformation of Soft Elastomeric Layers by Periodic Interfacial Tension Gradients," *Langmuir*, **19**, 2473-2478 (2003).
15. V. Gkanis and S. Kumar, "Instability of Creeping Couette Flow past a Neo-Hookean Solid," *Phys. Fluids* **15**, 2864-2871 (2003).

16. S. Kumar and O. K. Matar, "On the Faraday Instability in a Surfactant-covered Liquid," *Phys. Fluids* **16**, 39-46 (2004); Erratum: *Phys. Fluids* **16**, 3239 (2004).
17. V. Shankar and S. Kumar, "Instability of Viscoelastic Plane Couette Flow past a Deformable Wall," *J. Non-Newtonian Fluid Mech.* **116**, 371-393 (2004).
18. S. Kumar and O. K. Matar, "Dewetting of Thin Liquid Films near Soft Elastomeric Layers," *J. Colloid Interface Sci.* **273**, 581-588 (2004).
19. M. D. Eggert and S. Kumar, "Observations of Instability, Hysteresis, and Oscillation in Low-Reynolds-number Flow past Polymer Gels," *J. Colloid Interface Sci.* **278**, 234-242 (2004).
20. O. K. Matar and S. Kumar, "Rupture of a Surfactant-covered Thin Liquid Film on a Flexible Wall," *SIAM J. Appl. Math.* **64**, 2144-2166 (2004).
21. S. H. Kim, A. S. Panwar, S. Kumar, K. H. Ahn, and S. J. Lee, "Electrophoresis of a Bead-rod Chain through a Narrow Slit: A Brownian Dynamics Study," *J. Chem. Phys.* **121**, 9116-9122 (2004).
22. O. K. Matar, S. Kumar, and R. V. Craster, "Nonlinear Parametrically Excited Surface Waves in Surfactant-covered Thin Liquid Films," *J. Fluid Mech.* **520**, 243-265 (2004).
23. F. Sausset, O. Cadot, and S. Kumar, "Experimental Observation of Frequency Doubling in a Viscoelastic Mixing Layer," *C. R. Mecanique* **332**, 1001-1006 (2004).
24. V. Gkanis and S. Kumar, "Stability of Pressure-driven Creeping Flows in Channels Lined with a Nonlinear Elastic Solid," *J. Fluid Mech.* **524**, 357-375 (2005).
25. O. K. Matar, V. Gkanis, and S. Kumar, "Nonlinear Evolution of Thin Liquid Films Dewetting near Soft Elastomeric Layers," *J. Colloid Interface Sci.* **286**, 319-332 (2005).
26. A. S. Panwar and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow," *J. Chem. Phys.* **122**, 154902 (12 pages) (2005).
27. P. Huber, V. P. Soprunyuk, J. P. Embs, C. Wagner, M. Deutsch, and S. Kumar, "Faraday Instability in a Surface-frozen Liquid," *Phys. Rev. Lett.* **94**, 184504 (4 pages) (2005).
28. X. Yin and S. Kumar, "Lubrication Flow between a Cavity and a Flexible Wall," *Phys. Fluids* **17**, 063101 (13 pages) (2005).
29. X. Yin and S. Kumar, "Flow Visualization of the Liquid Emptying Process in Scaled-up Gravure Grooves and Cells," *Chem. Eng. Sci.* **61**, 1146-1156 (2006).
30. A. S. Panwar and S. Kumar, "Time Scales in Polymer Electrophoresis through Narrow Constrictions: A Brownian Dynamics Study," *Macromolecules* **39**, 1279-1289 (2006).
31. V. Gkanis and S. Kumar, "Instability of Creeping Flow past a Deformable Wall: The Role of Depth-dependent Modulus," *Phys. Rev. E* **73**, 026307 (8 pages) (2006).

32. V. Gkanis and S. Kumar, "Instability of Gravity-driven Free-surface Flow past a Deformable Elastic Solid," *Phys. Fluids* **18**, 044103 (11 pages) (2006).
33. X. Yin and S. Kumar, "Two-dimensional Simulations of Flow near a Cavity and a Flexible Solid Boundary," *Phys. Fluids* **18**, 063103 (10 pages) (2006).
34. S. A. Roberts and S. Kumar, "Stability of Creeping Couette Flow of a Power-law Fluid past a Deformable Solid," *J. Non-Newtonian Fluid Mech.* **139**, 93-102 (2006).
35. B. Suman and S. Kumar, "Dynamics of Thin Liquid Films on Surfaces with a Time-periodic Wettability," *J. Colloid Interface Sci.* **304**, 208-213 (2006).
36. R. D. Lenz and S. Kumar, "Competitive Displacement of Thin Liquid Films on Chemically Patterned Substrates," *J. Fluid Mech.* **571**, 33-57 (2007).
37. N. Hoda and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption onto Charged Patterned Surfaces," *Langmuir* **23**, 1741-1751 (2007).
38. O. K. Matar and S. Kumar, "Dynamics and Stability of Flow down a Flexible Incline," *J. Eng. Math.* **57**, 145-158 (2007).
39. B. Suman and S. Kumar, "Adsorption of Charged Dendrimers: A Brownian Dynamics Study," *J. Phys. Chem. B* **111**, 8728-8739 (2007).
40. N. Hoda and S. Kumar, "Kinetic Theory of Polyelectrolyte Adsorption in Shear Flow," *J. Rheol.* **51**, 799-820 (2007).
41. R. D. Lenz and S. Kumar, "Steady Two-layer Flow in a Topographically Patterned Channel," *Phys. Fluids* **19**, 102103 (9 pages) (2007).
42. R. D. Lenz and S. Kumar, "Instability of Confined Thin Liquid Film Trilayers," *J. Colloid Interface Sci.* **316**, 660-670 (2007).
43. N. Hoda and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption onto Topographically Patterned Surfaces," *Langmuir* **23**, 11747-11760 (2007).
44. O. K. Matar, R. V. Craster, and S. Kumar, "Falling Films on Flexible Inclines," *Phys. Rev. E* **76**, 056301 (17 pages) (2007).
45. N. Hoda and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow with Hydrodynamic Interaction," *J. Chem. Phys.* **127**, 234902 (15 pages) (2007).
46. E. K. Hobbie, S. Lin-Gibson, and S. Kumar, "Non-Brownian Microrheology of a Fluid-Gel Interface," *Phys. Rev. Lett.* **100**, 076001 (4 pages) (2008).
47. N. Hoda and S. Kumar, "Theory of Polyelectrolyte Adsorption onto Surfaces Patterned with Charge and Topography," *J. Chem. Phys.* **128**, 124907 (12 pages) (2008).

48. N. Hoda, M. R. Jovanović, and S. Kumar, “Energy Amplification in Channel Flows of Viscoelastic Fluids,” *J. Fluid Mech.* **601**, 407-424 (2008).
49. N. Hoda and S. Kumar, “Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow: Effects of Solvent Quality and Charge Patterning,” *J. Chem. Phys.* **128**, 164907 (12 pages) (2008).
50. B. Suman and S. Kumar, “Surfactant- and Elasticity-induced Inertialess Instabilities in Vertically Vibrated Liquids,” *J. Fluid Mech.* **610**, 407-423 (2008).
51. A. Shrivastava, E. L. Cussler, and S. Kumar, “Mass Transfer Enhancement due to a Soft Elastic Boundary,” *Chem. Eng. Sci.* **63**, 4302-4305 (2008).
52. A. Shrivastava, S. Kumar, and E. L. Cussler, “Predicting the Effect of Membrane Spacers on Mass Transfer,” *J. Membrane Sci.* **323**, 247-256 (2008).
53. N. Hoda and S. Kumar, “Boundary Integral Simulations of Liquid Emptying from a Model Gravure Cell,” *Phys. Fluids* **20**, 092106 (12 pages) (2008).
54. D. D. Brewer, J. Allen, M. R. Miller, J. M. DeSantos, S. Kumar, D. J. Norris, M. Tsapatis, and L. E. Scriven, “Mechanistic Principles of Colloidal Crystal Growth by Evaporation-induced Convective Steering,” *Langmuir* **24**, 13683-13693 (2008).
55. B. Suman and S. Kumar (**Invited**), “Brownian Dynamics Simulations of Hydrophobic Dendrimer Adsorption,” *Mol. Simul.* **39**, 38-49 (2009).
56. N. Hoda and S. Kumar, “Parameters Influencing Diffusion Dynamics of an Adsorbed Polymer Chain,” *Phys. Rev. E* **79**, 020801(R) (4 pages) (2009).
57. B. Suman and S. Kumar, “Draw Ratio Enhancement in Non-isothermal Melt Spinning,” *AIChE J.* **55**, 581-593 (2009).
58. N. Hoda, M. R. Jovanović, and S. Kumar, “Frequency Responses of Streamwise-constant Perturbations in Channel Flows of Oldroyd-B Fluids,” *J. Fluid Mech.* **625**, 411-434 (2009).
59. S. A. Roberts and S. Kumar, “AC Electrohydrodynamic Instabilities in Thin Liquid Films,” *J. Fluid Mech.* **631**, 255-279 (2009).
60. S. Dodds, M. S. Carvalho, and S. Kumar, “Stretching and Slipping of Liquid Bridges near Plates and Cavities,” *Phys. Fluids* **21**, 092103 (15 pages) (2009).
61. G. M. Sisoiev, O. K. Matar, R. V. Craster, and S. Kumar, “Coherent Wave Structures on Falling Fluid Films Flowing Down a Flexible Wall,” *Chem. Eng. Sci.* **65**, 950-961 (2010).
62. B. Tsai, M. S. Carvalho, and S. Kumar, “Leveling in Thin Films of Colloidal Suspensions,” *J. Colloid Interface Sci.* **343**, 306-313 (2010).
63. J. Cho, S. Kumar, and K. D. Dorfman, “Electrophoretic Collision of a DNA Molecule with a Small Elliptical Obstacle,” *Electrophoresis* **31**, 860-867 (2010).

64. M. R. Jovanović and S. Kumar, “Transient Growth without Inertia,” *Phys. Fluids* **22**, 023101 (19 pages) (2010).
65. S. K. Kalpathy, L. F. Francis, and S. Kumar, “Shear-induced Suppression of Rupture in Two-layer Thin Liquid Films,” *J. Colloid Interface Sci.* **348**, 271-279 (2010).
66. C. Zhou and S. Kumar, “Thermal Instabilities in Melt Spinning of Viscoelastic Fibers,” *J. Non-Newtonian Fluid Mech.* **165**, 879-891 (2010).
67. D. Tan, C. Zhou, C. J. Ellison, S. Kumar, C. W. Macosko, and F. S. Bates, “Meltblown Fibers: Influence of Viscosity and Elasticity on Diameter Distribution,” *J. Non-Newtonian Fluid Mech.* **165**, 892-900 (2010).
68. D. D. Brewer, M. Tsapatsis, and S. Kumar, “Dynamics of Surface Structure Evolution in Colloidal Adsorption: Charge Patterning and Polydispersity,” *J. Chem. Phys.* **133**, 034709 (14 pages) (2010).
69. T. D. Reynolds, S. K. Kalpathy, S. Kumar, and L. F. Francis, “Dip Coating of Charged Colloidal Suspensions onto Substrates with Patterned Wettability: Coating Regime Maps,” *J. Colloid Interface Sci.* **352**, 202-210 (2010).
70. S. A. Roberts and S. Kumar, “Electrohydrodynamic Instabilities in Thin Liquid Trilayer Films,” *Phys. Fluids*. **22**, 122102 (15 pages) (2010).
71. W. Fan, N. Atchison, D. D. Brewer, M. A. Arunagirinathan, B. J. Hering, E. Kokkoli, S. Kumar, K. K. Papas, and M. Tsapatsis, “Silica Nanoparticle Coatings by Adsorption from Lys-Sil Sols on Inorganic and Biological Surfaces,” *Angew. Chem. Int. Ed.* **50**, 1617-1621 (2011).
72. S. Dodds, M. S. Carvalho, and S. Kumar, “Stretching Liquid Bridges with Bubbles: The Effect of Air Bubbles on Liquid Transfer,” *Langmuir* **27**, 1556-1559 (2011).
73. M. R. Jovanović and S. Kumar, “Nonmodal Amplification of Stochastic Disturbances in Strongly Elastic Channel Flows,” *J. Non-Newtonian Fluid Mech.* **166**, 755-778 (2011).
74. C. Zhou, D. H. Tan, A. P. Janakiraman, and S. Kumar, “Modeling the Melt Blowing of Viscoelastic Materials,” *Chem. Eng. Sci.* **66**, 4172-4183 (2011).
75. S. Dodds, M. S. Carvalho, and S. Kumar, “Stretching Liquid Bridges with Moving Contact Lines: The Role of Inertia,” *Phys. Fluids* **23**, 092101 (11 pages) (2011).
76. K. L. Maki and S. Kumar, “Fast Evaporation of Spreading Droplets of Colloidal Suspensions,” *Langmuir* **18**, 11347-11363 (2011).
77. D. D. Brewer, T. Shibuta, L. F. Francis, S. Kumar, and M. Tsapatsis, “Coating Process Regimes in Particulate Film Production by Forced-convection-assisted Drag-out,” *Langmuir* **18**, 11660-11670 (2011).

78. D. Maza, S. Kumar, and M. S. Carvalho, “Spreading and Merging of Liquid Streams Flowing Down an Inclined Plane: Modeling and Experiments,” submitted, *Phys. Fluids*.
79. E. A. Vandre, M. S. Carvalho, and S. Kumar, “Delaying the Onset of Dynamic Wetting Failure through Meniscus Confinement,” submitted, *J. Fluid Mech.*

## **B. Other**

1. O. Cadot and S. Kumar, “Experimental Characterization of Polymer Effects on Two- and Three-dimensional Shear Instabilities,” in *Advances in Turbulence VIII, Proceedings of the Eighth European Turbulence Conference*, Barcelona, Spain, June 27-30, 2000, 31-34.
2. O. Cadot and S. Kumar, “Three-dimensional Stabilization of a Vortex Street in Viscoelastic Liquids,” in A. Maurel and P. Petitjeans (eds.), *Vortex Structure and Dynamics, Lecture Notes in Physics* (Springer-Verlag, Berlin, 2000), 135-139.
3. X. Yin and S. Kumar, “Flow Visualization Studies in Scaled-up Gravure Grooves and Cells,” in *2003 Proceedings of the Technical Association of the Graphic Arts*, 540-545.
4. S. Kumar, “Brownian Dynamics Simulation of Polymer Behavior in Nano- and Microfluidic Systems,” in *Proceedings of the 2004 International Conference on Computational & Experimental Engineering & Sciences*, Madeira, Portugal, July 26-29, 2004, 1469-1472.
5. S. Kumar, “Brownian Dynamics Simulations of Polymer Behavior in Nanofluidic and Microfluidic Systems,” in *Proceedings of the Fifth International Conference on Nanochannels, Microchannels and Minichannels*, Puebla, Mexico, June 18-20, 2007, ICNMM2007-30162 (3 pages).
6. N. Hoda and S. Kumar, “Polyelectrolyte Adsorption in Shear Flow with Hydrodynamic Interaction: Kinetic Theory and Brownian Dynamics Simulations,” in *AIP Conference Proceedings Volume 1027, The XVth International Congress on Rheology*, Monterey, CA, August 3-8, 2008, 968-969.
7. N. Hoda, M. R. Jovanović and S. Kumar (**Invited**), “Input-Output Analysis of the 2D/3C Model in Channel Flows of Viscoelastic Fluids,” in *Proceedings of the 47th IEEE Conference on Decision and Control*, Cancun, Mexico, December 9-11, 2008, 841-846.
8. M. R. Jovanović and S. Kumar (**Invited**), “Variance Amplification in Channel Flows of Strongly Elastic Polymer Solutions,” in *Proceedings of the 2009 American Control Conference*, St. Louis, MO, June 10-12, 2009, 842-847.
9. M. R. Jovanović and S. Kumar (**Invited**), “Transient Response of Velocity Fluctuations in Inertialess Channel Flows of Viscoelastic Fluids,” in *Proceedings of the 2010 American Control Conference*, Baltimore, MD, June 30-July 2, 2010, 5682-5687.

## **Conference Presentations**

1. S. Kumar and M. Tirrell, "Optical Properties of Thin Polymer Films," 1992 National Conference on Undergraduate Research, Minneapolis, MN.
2. S. Kumar and G. M. Homsy, "Chaotic Advection in Creeping Flow of Viscoelastic Fluids between Slowly Modulated Eccentric Cylinders," 1995 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Irvine, CA.
3. S. Kumar and G. M. Homsy, "Chaotic Advection in Creeping Flow of Viscoelastic Fluids between Slowly Modulated Eccentric Cylinders," 1996 Annual Meeting of the American Institute of Chemical Engineers, Chicago, IL.
4. S. Kumar and G. M. Homsy, "Numerical Simulation of Hydrodynamic Instabilities in Viscoelastic Free Shear Layers," 1997 Annual Meeting of the Society for Industrial and Applied Mathematics, Stanford, CA.
5. S. Kumar and G. M. Homsy, "Numerical Simulation of Hydrodynamic Instabilities in Viscoelastic Free Shear Layers," 1997 Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Francisco, CA.
6. S. Kumar, "Parametrically Driven Surface Waves in Viscoelastic Liquids," 1999 Annual Meeting of the American Physical Society Division of Fluid Dynamics, New Orleans, LA.
7. S. Kumar and R. G. Larson, "Shear Banding and Secondary Flow in Viscoelastic Fluids between a Cone and Plate," 2000 Annual Meeting of the American Institute of Chemical Engineers, Los Angeles, CA.
8. S. Kumar and R. G. Larson, "Brownian Dynamics Simulations of Flexible Polymers with Spring-Spring Repulsions," 2001 Annual Meeting of the American Institute of Chemical Engineers, Reno, NV.
9. S. Kumar, "Parametric Instability of a Liquid Sheet," 2001 Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Diego, CA.
10. X. Yin and S. Kumar, "Flow Visualization Studies in Scaled-up Gravure Grooves and Cells," 11th (2002) International Coating Science and Technology Symposium, Minneapolis, MN (poster).
11. S. Kumar and V. Gkanis, "Instability of Creeping Couette Flow past a Neo-Hookean Solid," 2002 Annual Meeting of the American Institute of Chemical Engineers, Indianapolis, IN.
12. S. Kumar and O. K. Matar, "Parametrically Driven Surface Waves in Surfactant-covered Liquids," 2002 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Dallas, TX.
13. X. Yin and S. Kumar, "Flow Visualization Studies in Scaled-up Gravure Grooves and Cells," 2003 Annual Technical Conference of the Technical Association of the Graphic Arts,

Montreal, Canada.

14. V. Gkanis, M. Eggert, and S. Kumar, "Flow Instabilities near Soft Elastic Solids: Linear and Nonlinear Behavior," 2003 Annual Meeting of the Society of Rheology, Pittsburgh, PA.
15. A. S. Panwar (speaker) and S. Kumar, "Brownian Dynamics Simulations of Polymer Stretching and Transport in a Complex Electro-osmotic Flow," 2003 Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA.
16. S. Kumar, "Deformation of Soft Elastomeric Layers by Periodic Interfacial Tension Gradients," 2003 Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA.
17. V. Gkanis (speaker) and S. Kumar, "Instability of Creeping Couette Flow Past a Neo-Hookean Solid," 2003 Annual Meeting of the American Physical Society Division of Fluid Dynamics, East Rutherford, NJ.
18. X. Yin and S. Kumar, "Flow Visualization Studies in Scaled-up Gravure Grooves and Cells," 2003 Annual Meeting of the American Physical Society Division of Fluid Dynamics, East Rutherford, NJ.
19. S. Kumar and O. K. Matar, "The Faraday Instability in a Surfactant-covered Liquid," 2003 Annual Meeting of the American Physical Society Division of Fluid Dynamics, East Rutherford, NJ.
20. S. Kumar (**Keynote lecture**), "Brownian Dynamics Simulations of Polymer Behavior in Nano- and Microfluidic Systems," 2004 International Conference on Computational & Experimental Engineering & Sciences, Madeira, Portugal.
21. X. Yin and S. Kumar, "Visualization and Modeling of Flow in Gravure Grooves and Cells," 12th (2004) International Coating Science and Technology Symposium, Rochester, NY.
22. R. D. Lenz and S. Kumar, "Liquid Displacement in Lithographic Printing: Visualization and Modeling," 12th (2004) International Coating Science and Technology Symposium, Rochester, NY (poster).
23. M. D. Eggert and S. Kumar, "Observations of Instability, Hysteresis, and Oscillation in Low-Reynolds-number Flow past Polymer Gels," 2004 Annual Meeting of the American Institute of Chemical Engineers, Austin, TX.
24. A. S. Panwar (speaker) and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow," 2004 Annual Meeting of the American Institute of Chemical Engineers, Austin, TX.
25. S. Kumar, V. Gkanis, and O. K. Matar, "Nonlinear Evolution of Thin Liquid Films Dewetting near Soft Elastomeric Layers," 2004 Annual Meeting of the American Institute

of Chemical Engineers, Austin, TX.

26. R. V. Craster, O. K. Matar (speaker), and S. Kumar, "The Effect of Surfactant on Non-linear Parametrically Excited Surface Waves in Thin Liquid Films," 2004 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA.
27. S. Kumar, V. Gkanis, and O. K. Matar, "Nonlinear Evolution of Thin Liquid Films Dewetting near Soft Elastomeric Layers," 2004 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA.
28. V. Gkanis (speaker) and S. Kumar, "Stability of Pressure-driven Creeping Flows in Channels Lined with a Nonlinear Elastic Solid," 2004 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Seattle, WA.
29. A. S. Panwar (speaker) and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow," 2005 Annual March Meeting of the American Physical Society, Los Angeles, CA.
30. S. H. Kim, A. S. Panwar, S. Kumar, K. H. Ahn, and S. J. Lee, "Electrophoresis of a Bead-rod Chain through a Narrow Slit: A Brownian Dynamics Study," 2005 Annual March Meeting of the American Physical Society, Los Angeles, CA.
31. S. Kumar (**Invited**), "Flow Instabilities near Polymer Gels: Linear and Nonlinear Behavior," 2005 Spring Eastern Sectional Meeting of the American Mathematical Society, Newark, DE.
32. A. S. Panwar and S. Kumar, "Brownian Dynamics Simulations of Polymer Behavior in Microfluidic Systems," 2005 Gordon Research Conference on the Physics & Chemistry of Microfluidics, Oxford, United Kingdom (poster).
33. P. Huber and S. Kumar, "Faraday Instability in a Surface-frozen Liquid," 2005 Annual Meeting of the Society of Rheology, Vancouver, Canada.
34. V. Shankar, S. Kumar, and E. K. Hobbie, "Instability of Viscoelastic Plane Couette Flow past a Deformable Wall," 2005 Annual Meeting of the Society of Rheology, Vancouver, Canada.
35. P. Huber and S. Kumar, "Faraday Instability in a Surface-frozen Liquid," 2005 Annual Meeting of the American Institute of Chemical Engineers, Cincinnati, OH.
36. R. D. Lenz (speaker) and S. Kumar, "Competitive Displacement of Thin Liquid Films on Chemically Patterned Substrates," 2005 Annual Meeting of the American Institute of Chemical Engineers, Cincinnati, OH.
37. A. S. Panwar and S. Kumar, "Time Scales in Polymer Electrophoresis through Narrow Constrictions: A Brownian Dynamics Study," 2005 Annual Meeting of the American Institute of Chemical Engineers, Cincinnati, OH.

38. R. D. Lenz (speaker) and S. Kumar, "Competitive Displacement of Thin Liquid Films on Chemically Patterned Substrates," 2005 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Chicago, IL.
39. P. Huber and S. Kumar, "Faraday Instability in a Surface-frozen Liquid," 2005 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Chicago, IL.
40. S. Kumar, S. Lin-Gibson, and E. K. Hobbie (speaker), "Instability of a Sheared Fluid-Gel Interface," 2006 Annual March Meeting of the American Physical Society, Baltimore, MD.
41. A. S. Panwar and S. Kumar (**Invited**), "Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow," 2006 Spring National Meeting of the American Chemical Society, Atlanta, GA.
42. R. D. Lenz (speaker) and S. Kumar, "Competitive Displacement of Thin Liquid Films on Chemically Patterned Substrates," 13th (2006) International Coating Science and Technology Symposium, Denver, CO.
43. S. Kumar (**Invited**), "Brownian Dynamics Simulations of Polymers: Modeling Long Molecules for Long Times," Army High Performance Computing Research Center/Army Research Laboratory Multidisciplinary Workshop on Verification and Validation (2006), Aberdeen, MD.
44. E. K. Hobbie (speaker), S. Lin-Gibson, and S. Kumar, "Non-Brownian Microrheology of a Fluid-Gel Interface," 2006 Annual Meeting of the Society of Rheology, Portland, Maine.
45. X. Yin and S. Kumar, "Flow between a Cavity and a Flexible Wall: Lubrication Model and Finite-element Calculations," 2006 Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA.
46. N. Hoda (speaker) and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption onto Charged Patterned Surfaces," 2006 Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA.
47. E. K. Hobbie (speaker), S. Lin-Gibson, and S. Kumar, "Non-Brownian Microrheology of a Fluid-Gel Interface," 2006 Annual Meeting of the American Institute of Chemical Engineers, San Francisco, CA.
48. X. Yin and S. Kumar, "Flow between a Cavity and a Flexible Wall: Lubrication Model and Finite-element Calculations," 2006 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Tampa, FL.
49. R. D. Lenz (speaker) and S. Kumar, "Steady Two-layer Flow in a Topographically Patterned Channel," 2006 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Tampa, FL.

50. S. A. Roberts (speaker) and S. Kumar, "Stability of Creeping Couette Flow of a Power-law Fluid past a Deformable Solid," 2006 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Tampa, FL.
51. S. Kumar (**Keynote lecture**), "Brownian Dynamics Simulations of Polymer Behavior in Nanofluidic and Microfluidic Systems," Fifth (2007) International Conference on Nanochannels, Microchannels and Minichannels, Puebla, Mexico.
52. S. Kumar (**Invited**), "Fundamental Research Needs for the Large-scale Printing of Nanoscale and Microscale Devices," 2007 International Electronics Packaging Symposium: National Trends in Small Scale Systems and Microelectronics Packaging, Niskayuna, NY.
53. S. Kumar (**Invited**), "Three Frontier Areas for Thin Liquid Film Research," Euromech 490 Workshop (2007): Dynamics and Stability of Thin Liquid Films and Slender Jets, London, England.
54. N. Hoda (speaker) and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption onto Topographically Patterned Surfaces," 2007 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
55. N. Hoda (speaker) and S. Kumar, "Polyelectrolyte Adsorption in Shear Flow with Hydrodynamic Interactions: Kinetic Theory and Brownian Dynamics Simulations," 2007 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
56. A. Shrivastava (speaker), S. Kumar, and E. L. Cussler, "Enhancing Mass Transfer with Flow Over Soft Surfaces," 2007 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
57. A. Shrivastava (speaker), S. Kumar, and E. L. Cussler, "The Modified L ev eque Limit for Spacer-filled Channels," 2007 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
58. B. Suman (speaker) and S. Kumar, "Dynamics of Thin Liquid Films on Surfaces with a Time-periodic Wettability," 2007 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
59. B. Suman (speaker) and S. Kumar, "Adsorption of Charged Dendrimers: A Brownian Dynamics Study," 2007 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
60. O. K. Matar (speaker), R. V. Craster, and S. Kumar, "Falling Films on Flexible Substrates," 2007 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Salt Lake City, UT.
61. N. Hoda and S. Kumar, "Polyelectrolyte Adsorption in Shear Flow with Hydrodynamic Interaction: Kinetic Theory and Brownian Dynamics Simulations," XVth (2008) International Congress on Rheology, Monterey, CA.

62. B. Tsai, W. J. Suszynski, M. S. Carvalho, and S. Kumar, "Surface Patterning via Continuous Coating of Colloidal Suspensions," 14th (2008) International Coating Science and Technology Symposium, Marina del Rey, CA (poster).
63. N. Hoda and S. Kumar, "Boundary Integral Simulations of Liquid Emptying from Model Gravure Cells," 14th (2008) International Coating Science and Technology Symposium, Marina del Rey, CA.
64. D. D. Brewer (speaker), S. Kumar, and M. Tsapatsis, "Liquid Flow in Assembly of Ordered Colloidal Crystals," 14th (2008) International Coating Science and Technology Symposium, Marina del Rey, CA.
65. S. Dodds (speaker) and S. Kumar, "Extensional Deformation of Liquid Bridges near Gravure Cells," 14th (2008) International Coating Science and Technology Symposium, Marina del Rey, CA.
66. D. M. Quiñones (speaker), M. S. Carvalho, and S. Kumar, "Coating Process of Photosensitive Cylinders," 14th (2008) International Coating Science and Technology Symposium, Marina del Rey, CA.
67. R. D. Lenz and S. Kumar, "Instability of Confined Thin Liquid Film Trilayers with Application to Lithographic Printing," 14th (2008) International Coating Science and Technology Symposium, Marina del Rey, CA.
68. S. Kumar, "The Fluid Mechanics of Printing Processes," 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.
69. B. Suman and S. Kumar, "Brownian Dynamics Simulations of Hydrophobic Dendrimer Adsorption," 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.
70. B. Suman and S. Kumar, "Draw Ratio Enhancement in Non-isothermal Melt Spinning," 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.
71. N. Hoda (speaker) and S. Kumar, "Theory of Polyelectrolyte Adsorption onto Surfaces Patterned with Charge and Topography," 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.
72. N. Hoda (speaker), M. R. Jovanović, and S. Kumar, "Energy Amplification in Channel Flows of Viscoelastic Fluids," 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.
73. N. Hoda (speaker) and S. Kumar, "Brownian Dynamics Simulations of Polyelectrolyte Adsorption in Shear Flow: Effects of Solvent Quality and Charge Patterning," 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.
74. D. D. Brewer (speaker), J. Allen, M. R. Miller, J. M. DeSantos, L. E. Scriven, S.

Kumar, and M. Tsapatsis, “Convective Steering in Growth of Colloidal Crystals,” 2008 Annual Meeting of the American Institute of Chemical Engineers, Philadelphia, PA.

75. S. A. Roberts (speaker) and S. Kumar, “AC Electrohydrodynamic Instabilities in Thin Liquid Films,” 2008 Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX.

76. S. Dodds (speaker), S. Kumar, and M. S. Carvalho, “Stretching and Slipping Liquid Bridges near Cavities” 2008 Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX.

77. M. R. Jovanović (speaker), N. Hoda, and S. Kumar, “Non-modal Energy Amplification in Channel Flows of Viscoelastic Fluids,” 2008 Annual Meeting of the American Physical Society Division of Fluid Dynamics, San Antonio, TX.

78. S. Kumar and M. R. Jovanović (**Invited**), “Non-modal Amplification of Disturbances in Channel Flows of Viscoelastic Fluids: A Possible Route to Elastic Turbulence?”, Flowing Complex Fluids: Fluid Mechanics-Interaction of Microstructure and Flow Workshop (2009), Institute for Mathematics and Its Applications, Minneapolis, MN.

79. N. Hoda, M. R. Jovanović, and S. Kumar, “Non-modal Amplification of Disturbances in Channel Flows of Viscoelastic Fluids: A Possible Route to Elastic Turbulence?”, 2009 Annual Meeting of the Society of Rheology, Madison, WI.

80. C. Zhou (speaker) and S. Kumar, “Thermal Instabilities in Melt Spinning of Viscoelastic Fibers”, 2009 Annual Meeting of the Society of Rheology, Madison, WI.

81. D. H. Tan (speaker), C. Zhou, S. Kumar, C. W. Macosko, F. S. Bates, and C. J. Ellison, “Influence of Viscosity and Elasticity on the Diameter Distribution of Meltblown Polymer Fibers,” 2009 Annual Meeting of the Society of Rheology, Madison, WI.

82. S. A. Roberts and S. Kumar, “AC Electrohydrodynamic Instabilities in Thin Liquid Films: A Route to Hydrodynamic Self-Assembly of Topographical Patterns in Soft Materials, 2009 U. S. Department of Energy Contractors Meeting, Warrenton, VA (poster).

83. S. A. Roberts and S. Kumar, “AC Electrohydrodynamic Instabilities in Thin Liquid Films,” 2009 Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN.

84. S. Dodds (speaker), S. Kumar, and M. S. Carvalho, “Stretching and Slipping Liquid Bridges near Cavities” 2009 Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN.

85. S. Dodds and S. Kumar, “The Emptying of Liquid from Gravure Cells,” 2009 Annual Meeting of the American Institute of Chemical Engineers, Nashville, TN (poster).

86. B. Suman and S. Kumar, “Surfactant- and Elasticity-induced Instabilities in Vertically

Vibrated Liquids,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

87. G. M. Sisoiev (speaker), O. K. Matar, R. V. Craster, and S. Kumar, “Coherent Wave Structures on Falling Fluid Films Flowing Down a Flexible Wall,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

88. S. K. Kalpathy (speaker), L. F. Francis, and S. Kumar, “Shear-induced Suppression of Rupture in Two-layer Thin Liquid Films,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

89. S. A. Roberts (speaker) and S. Kumar, “Electrohydrodynamic Instabilities in Thin Bilayer Liquid Films,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

90. M. R. Jovanović (speaker) and S. Kumar, “Transient Growth Without Inertia,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

91. C. Zhou (speaker) and S. Kumar, “Thermal Instabilities in Melt Spinning of Viscoelastic Fibers,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

92. D. D. Brewer (speaker), S. Kumar, and M. Tsapatsis, “Colloidal Crystal Growth by Evaporation-induced Convective Steering,” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

93. S. Dodds (speaker), M. S. Carvalho, and S. Kumar, “Stretching Bridges and Bubbles: The Effect of Air Bubbles on Liquid Transfer” 2009 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Minneapolis, MN.

94. S. Dodds, M. S. Carvalho, and S. Kumar (**Invited**), “Stretching and Slipping Liquid Bridges near Plates and Cavities,” Small-scale Hydrodynamics: Microfluidics and Thin Films Workshop (2010), Banff International Research Station for Mathematical Innovation and Discovery, Banff, Canada.

95. D. D. Brewer (speaker), J. Allen, M. Miller, J. de Santos, L.E. Scriven, D. J. Norris, S. Kumar and M. Tsapatsis, “Convective Steering in Growth of Colloidal Crystals”, 2010 Spring Meeting of the Materials Research Society, San Francisco, CA.

96. S. Kumar and M. R. Jovanović (**Invited**), “Non-modal Amplification of Disturbances in Channel Flows of Viscoelastic Fluids”, Flow Instabilities and Turbulence in Viscoelastic Fluids Workshop (2010), Lorentz Center, Leiden, Netherlands.

97. S. Dodds (speaker), M. S. Carvalho, and S. Kumar, “The Effect of Air Bubbles on Liquid Transfer during Printing,” 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.

98. S. K. Kalpathy (speaker), L. F. Francis, and S. Kumar, "Shear-induced Suppression of Rupture in Thin Liquid Films with Application to Lithographic Printing," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.
99. D. M. Quiñones, M. S. Carvalho (speaker), and S. Kumar, "Coating Process of Photo-sensitive Cylinders," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.
100. B. Tsai, M. S. Carvalho, and S. Kumar, "Leveling of Thin Films of Colloidal Suspensions," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.
101. E. A. Vandre (speaker), M. S. Carvalho, and S. Kumar, "Delaying Wetting Failure in Coating Flows via Meniscus Confinement," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.
102. S. A. Roberts (speaker) and S. Kumar, "Formation of Topographical Patterns on Liquid Film Coatings using Electric Fields," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.
103. D. D. Brewer (speaker), M. Tsapatsis, and S. Kumar, "Dynamics of Surface Structure Evolution in Colloidal Adsorption: Charge Patterning and Polydispersity," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN.
104. S. Dodds, M. S. Carvalho, and S. Kumar, "Computational Efforts Towards a Better Understanding of Liquid Transfer in Printing Processes," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN (poster).
105. T. Matsuda, S. Kumar, L. F. Francis, and M. S. Carvalho, "Low-flow Limits in Slot Coating with Apparent Pinning Effect and No Recirculation," 15th (2010) International Coating Science and Technology Symposium, St. Paul, MN (poster).
106. S. Dodds (speaker), M. S. Carvalho, and S. Kumar, "The Effect of Bubbles On Liquid Transfer During Printing," 2010 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
107. D. D. Brewer (speaker), M. Tsapatsis, and S. Kumar, "Dynamics of Surface Structure Evolution in Colloidal Adsorption: Charge Patterning," 2010 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
108. C. Zhou (speaker) and S. Kumar, "Thermal Instabilities in Melt Spinning of Viscoelastic Fibers," 2010 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
109. S. A. Roberts (speaker) and S. Kumar, "Electrohydrodynamic Instabilities in Thin Tri-layer Liquid Films," 2010 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.

110. S. Dodds, M. S. Carvalho, and S. Kumar, "Liquid Transfer in Printing Processes: 2D and 3D Finite Element Simulations," 2010 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT (poster).
111. J. J. Derby, S. Kumar, P. Daoutidis, K. D. Dorfman, and A. V. McCormick (speaker), "Numerical Methods and Simulation in the Minnesota ChEn Curriculum," 2010 Annual Meeting of the American Institute of Chemical Engineers, Salt Lake City, UT.
112. E. A. Vandre (speaker), M. S. Carvalho, and S. Kumar, "Increasing the Critical Speed of Wetting Failure through Meniscus Confinement," 2010 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Long Beach, CA.
113. S. Dodds (speaker), M. S. Carvalho, and S. Kumar, "Inertial and Three-dimensional Effects in Stretching Liquid Bridges near Plates and Cavities," 2010 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Long Beach, CA.
114. C. Zhou (speaker), D. H. Tan, C. W. Macosko, F. S. Bates, and S. Kumar, "Simulating the Melt Blowing of Viscoelastic Materials," 2010 Annual Meeting of the American Physical Society Division of Fluid Dynamics, Long Beach, CA.
115. E. A. Vandre, M. S. Carvalho, and S. Kumar, "Delaying Wetting Failure in Coating Flows via Meniscus Confinement," 2011 European Coating Symposium, Turku, Finland.
116. S. Dodds, M. S. Carvalho, and S. Kumar, "Liquid Transfer in Printing Processes," 2011 European Coating Symposium, Turku, Finland.
117. S. A. Roberts and S. Kumar, "Formation of Topographical Patterns on Liquid Film Multilayer Coatings using Electric Fields," 2011 European Coating Symposium, Turku, Finland.
118. E. A. Vandre, M. S. Carvalho, and S. Kumar (**Invited**), "Delaying Wetting Failure in Coating Flows via Meniscus Confinement," Complex Fluids and Flows in Industry and Nature Workshop (2011), University of British Columbia, Vancouver, Canada.
119. K. L. Maki and S. Kumar, "Modeling Skin Formation in Drying Droplets of Colloidal Suspensions," 11th (2011) U. S. National Congress on Computational Mechanics, Minneapolis, MN.
120. S. Dodds (speaker), M. S. Carvalho, and S. Kumar, "The Dynamics of Three-Dimensional Liquid Bridges with Pinned and Moving Contact Lines," 11th (2011) U. S. National Congress on Computational Mechanics, Minneapolis, MN.
121. D. H. Tan (speaker), C. Zhou, S. Kumar, C. W. Macosko, and F. S. Bates, "Meltblown Fibers: Influence of Viscosity and Elasticity on Diameter Distribution," 11th (2011) U. S. National Congress on Computational Mechanics, Minneapolis, MN.
122. S. A. Roberts and S. Kumar, "Formation of Topographical Patterns on Liquid Film

Multilayer Coatings using Electric Fields,” 2011 U. S. Department of Energy Synthesis and Processing Science Principal Investigators Meeting, Arlington, VA.

### **Invited Seminars**

1. Université du Havre (Le Havre, France), Laboratoire de Mécanique, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” May 29, 1998.
2. Ecole Normale Supérieure (Paris, France), Laboratoire de Physique Statistique, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” June 3, 1998.
3. Ecole Supérieure de Physique et de Chimie Industrielles (Paris, France), Laboratoire de Physique et Mécanique de Milieux Hétérogènes, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” December 4, 1998.
4. Université Bordeaux I (Talence, France), Centre de Physique Moléculaire Optique et Hertzienne, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” January 29, 1999.
5. Université de Nice-Sophia Antipolis (Valbonne, France), Institut Non-Linéaire de Nice, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” February 12, 1999.
6. Massachusetts Institute of Technology, Department of Chemical Engineering, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” April 6, 1999.
7. University of Minnesota, Department of Chemical Engineering and Materials Science, “Hydrodynamic Instabilities in Viscoelastic Free Shear Layers,” April 15, 1999.
8. University of Minnesota, Department of Chemical Engineering and Materials Science, “Interfacial Instabilities: Problems and Applications in Compliant Media, Materials Processing, and Surface Waves,” May 27, 1999.
9. Université du Havre (Le Havre, France), Laboratoire de Mécanique, “Faraday Instability in Viscoelastic Liquids,” July 16, 1999.
10. 3M (St. Paul, MN), Advanced Materials Technology Center, “Flow Phenomena in Complex Fluids: Shear Banding and Polymer Entanglements,” July 25, 2001.
11. Forty-Second Annual Regional Symposium of the Upper Midwest Section of the American Institute of Chemical Engineers (Bloomington, MN), “Microscale Fluid Mechanics: From DNA Sequencing to Coating Processes,” April 16, 2002.
12. National Institute of Standards and Technology (Gaithersburg, MD), Polymers Division, “Some Flow and Transport Problems in Microfluidic Systems,” January 4, 2003.
13. 3M (St. Paul, MN), Engineering Systems Technology Center, “Flow Phenomena in Gravure Cells and Grooves,” January 21, 2003.

14. 3M (St. Paul, MN), Advanced Materials Technology Center, “Some Flow and Transport Problems in Microfluidic Systems,” February 21, 2003.
15. University of Minnesota, Department of Mathematics, “Some Flow and Transport Problems in Microfluidic Systems,” May 1, 2003.
16. Imperial College (London, England), Department of Mathematics, “Interfacial Instabilities in Complex Materials: Flows near Polymer Gels and Vibration-induced Surface Waves,” June 30, 2003.
17. University of Sheffield (Sheffield, England), Department of Chemical and Process Engineering, “Some Flow and Transport Problems in Nanofluidic and Microfluidic Systems,” July 7, 2003.
18. Schlumberger (Sugar Land, TX), Sugar Land Product Center, “Flow Instabilities near Polymer Gels: Linear and Nonlinear Behavior,” August 18, 2003.
19. International Centre for Mechanical Sciences (Udine, Italy), Microfluidics 2003: History, Theory, and Applications Summer Module, “Flow Instabilities near Polymer Gels: Linear and Nonlinear Behavior,” September 2, 2003.
20. International Centre for Mechanical Sciences (Udine, Italy), Microfluidics 2003: History, Theory, and Applications Summer Module, “Brownian Dynamics Simulations of Polymer Stretching and Transport in a Complex Electro-osmotic Flow,” September 3, 2003.
21. Sandia National Laboratories (Albuquerque, NM), “Flow Instabilities near Polymer Gels: Linear and Nonlinear Behavior,” March 1, 2004.
22. University of Minnesota, Supercomputing Institute for Digital Simulation and Advanced Computation, Particle-Based Mesoscale Simulation Techniques Symposium, “Brownian Dynamics Simulations of Polymer Behavior in Nano- and Microfluidic Systems,” April 2, 2004.
23. Massachusetts Institute of Technology, Department of Chemical Engineering, “Patterning Soft Materials using Interfacial Forces and Flows,” May 13, 2004.
24. Seoul National University (Seoul, Korea), School of Chemical Engineering, “Patterning Soft Materials using Interfacial Forces and Flows,” June 23, 2004.
25. Korea University (Seoul, Korea), Applied Rheology Center, “Patterning Soft Materials using Interfacial Forces and Flows,” June 24, 2004.
26. University of Minnesota, Institute for Mathematics and its Applications, “Microscale Flow and Transport Problems arising in Surfactant Rheology, Surface Patterning, and Polymer Electrophoresis,” February 25, 2005.
27. University of Wisconsin–Madison, Rheology Research Center, “Interfacial Instabilities as a Probe of Rheological Phenomena”, March 4, 2005.

28. Princeton University, Department of Chemical Engineering, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Surface Patterning, and Polymer Electrophoresis," March 30, 2005.
29. University of Delaware, Department of Chemical Engineering, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Surface Patterning, and Polymer Electrophoresis," April 1, 2005.
30. 3M (St. Paul, MN), Corporate Research Process Laboratory, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Surface Patterning, and Polymer Electrophoresis," September 12, 2005.
31. Washington University, Department of Chemical Engineering, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Surface Patterning, and Polymer Electrophoresis," September 26, 2005.
32. Dai Nippon Printing (Tokyo, Japan), "Printing Research at the University of Minnesota," January 10, 2006.
33. University of Tokyo (Tokyo, Japan), Department of Chemical System Engineering, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Surface Patterning, and Polymer Electrophoresis," January 13, 2006.
34. Cornell University, School of Chemical and Biomolecular Engineering, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Printing Processes, and Polymer Electrophoresis," February 13, 2006.
35. University of Michigan, Department of Chemical Engineering, "Interfacial Instabilities as a Probe of Rheological Phenomena", March 9, 2006.
36. Wayne State University, Department of Chemical Engineering and Materials Science, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Printing Processes, and Polymer Electrophoresis," March 10, 2006.
37. Army Research Laboratory, Weapons and Materials Research Directorate, "Brownian Dynamics Simulations of Polymers: Modeling Long Molecules for Long Times," March 27, 2006.
38. University of Southern California, Department of Chemical Engineering and Materials Science, "Microscale Flow and Transport Problems arising in Surfactant Rheology, Printing Processes, and Polymer Electrophoresis," February 2, 2007.
39. University of California at Santa Barbara, Department of Mechanical Engineering, "Squishy, Oily, and Frozen Interfaces: Instabilities and Applications," February 5, 2007.
40. University of Minnesota, St. Anthony Falls Laboratory, "Squishy, Oily, and Frozen Interfaces: Instabilities and Applications," February 14, 2007.

41. Tsinghua University (Beijing, China), Department of Chemical Engineering, “Microscale Flow and Transport Problems arising in Surfactant Rheology, Printing Processes, and Polymer Electrophoresis,” June 6, 2007.
42. University of Oklahoma, School of Chemical, Biological and Materials Engineering, “Microscale Flow and Transport Problems arising in Surfactant Rheology, Printing Processes, and Polymer Electrophoresis,” August 23, 2007.
43. University of Minnesota, Institute for Mathematics and its Applications, “Brownian Dynamics Simulations of Polymer Behavior in Nanofluidic and Microfluidic Systems,” January 22, 2008.
44. Stanford University, Department of Chemical Engineering, “Molecular and Continuum Modeling of Interfacial Dynamics: Insights into Polyelectrolyte Adsorption and High-speed Printing,” February 13, 2008.
45. Min Chung Technology Co. (Hsinchu, Taiwan), “Introduction to Gravure Coating,” April 27, 2009.
46. Industrial Technology Research Institute (Hsinchu, Taiwan), Material and Chemical Research Laboratories, “Fundamental Research Needs for the Large-scale Printing of Nanoscale and Microscale Devices,” April 28, 2009.
47. National Taiwan University (Taipei, Taiwan), Institute of Applied Mechanics, “Molecular and Continuum Modeling of Interfacial Dynamics: Insights into Polyelectrolyte Adsorption and High-speed Printing,” April 29, 2009.
48. University of Chicago, James Franck Institute, “Squishy, Frozen, and Elastic Interfaces: Instabilities and Applications,” August 19, 2009.
49. Peking University, Department of Mechanics and Aerospace Engineering, “Non-modal Amplification of Disturbances in Channel Flows of Viscoelastic Fluids,” August 31, 2011.
50. Beijing University of Technology, College of Mechanical Engineering and Applied Electronics Technology, “Interfacial Dynamics of Printing Processes,” September 2, 2011.
51. Chinese Academy of Sciences, Institute of Mechanics, “Non-modal Amplification of Disturbances in Channel Flows of Viscoelastic Fluids,” September 5, 2011.

## **PhD Students**

### **A. Former**

1. Xiuyan Yin, Chemical Engineering, July 2005  
Visualization and Modeling of Flow inside Gravure Cells and Grooves
2. Ajay S. Panwar, Materials Science and Engineering, July 2005

Polymer Dynamics in Microfluidic Devices: A Brownian Dynamics Study

3. Vasileios Gkanis, Chemical Engineering, August 2005  
Stability Analyses of Fluid Flows near Deformable Solids
4. Abhishek Shrivastava, Chemical Engineering, March 2007 (with E. L. Cussler)  
Faster Mass Transfer in Small Channels: Understanding Static Mixing Phenomena
5. Richard D. Lenz, Chemical Engineering, May 2007  
Liquid Displacement in Lithographic Printing: Modeling and Visualization
6. Balram Suman, Chemical Engineering, February 2008  
Continuum and Molecular Modeling of Interfacial Dynamics: Interfacial Instabilities, Melt Spinning, and Dendrimer Adsorption
7. Nazish Hoda, Chemical Engineering, April 2008  
Dynamics of Complex Fluids and Complex Flows near Surfaces: Continuum and Molecular Modeling
8. Scott A. Roberts, Chemical Engineering, December 2009  
Stability of Microscale Fluid Interfaces: A Study of Fluid Flows near Soft Substrates and Pattern Formation under Electrostatic Fields
9. Shawn Dodds, Chemical Engineering, July 2011 (with M. S. Carvalho)  
Stretching and Slipping Liquid Bridges: Liquid Transfer in Industrial Printing
10. Damien D. Brewer, Chemical Engineering, August 2011 (with M. Tsapatsis)  
Particulate Film Production by Adsorption and Drag-out Processes

## **B. Current**

1. Sreeram K. Kalpathy, Materials Science and Engineering (with L. F. Francis)
2. Eric A. Vandre, Chemical Engineering (with M. S. Carvalho)
3. Aruna Ramkrishnan, Chemical Engineering
4. Andrew J. Corbett, Materials Science and Engineering

## **MS Students (Former)**

Benson Tsai, Chemical Engineering, January 2009 (with M. S. Carvalho)  
Leveling of Thin Films of Colloidal Suspensions

## **Postdoctoral Students**

### **A. Former**

Chunfeng Zhou, 2008-2011  
Kara L. Maki, 2009-2011

**B. Current**

Changkwon Chung, 2011-  
Akhilesh Sahu, 2011-