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Education

The Indian Institute of Technology , Delhi, India	Textile Technology	B.Tech., 2002
The University of Massachusetts, Amherst, MA	Polymer Sci. & Engg.	M.S., 2004
The University of Massachusetts, Amherst, MA	Polymer Sci. & Engg.	Ph.D., 2008

Professional Experience (ORNL = Oak Ridge National Laboratory)

2010/7 –	American Recovery and Reinvestment Act (ARRA) Fellow, NCCS, ORNL
2008/8 – 2010/6	Post-doctoral research associate, Materials Research Laboratory, University of California, Santa Barbara, CA
2002-2003	Lecturer (Mathematics), Career Point Inc., Kota, India

Professional and Synergistic Activities

2006–present Reviewer, Journal of Chemical Physics, Macromolecules, European Polymer Journal E

Honors and Awards

2010–present	American Recovery and Reinvestment Act (ARRA) Fellowship, NCCS, ORNL
2000–2001	Jawahar Gajree Memorial Scholarship, The Indian Institute of Technology, Delhi
1999–2000	Award for social services from the National Service Scheme (NSS)
1994-1995	State merit scholarship from the Board of School Education, Haryana, India

Selected Publications

- X. Wang, M. Goswami, R. Kumar , B.G. Sumpter and J. Mays, “Morphologies of block copolymers composed of charged and neutral blocks”, *Soft Matter* , in press (2012).
- R.A. Riggleman, R. Kumar and G.H. Fredrickson, “Investigation of the interfacial tension of complex coacervates using field-theoretic simulations”, *J. Chem. Phys.* 136 , 024903 (2012).
- R. Kumar and B.G. Sumpter, “Quantitative analysis of chain packing in polymer melts using large scale molecular dynamics simulations”, *Proceedings of the Scientific Discovery through Advanced Computing (SciDAC) Conference*, Denver, CO (2011).
- M. Goswami, R. Kumar , B.G. Sumpter and J.W Mays, “Breakdown of inverse morphologies in charged diblock copolymers”, *J. Phys. Chem. B.* 115 , 3330 (2011).

- R. Kumar , D. Audus and G.H. Fredrickson, “Phase separation in symmetric mixtures of oppositely charged rodlike polyelectrolytes”, J. Phys. Chem. B. 114 , 9956 (2010).
- R. Kumar and M. Muthukumar, “Origin of translocation barriers for polyelectrolyte chains”, J. Chem. Phys. 131 , 194903 (2009).
- R. Kumar and G.H. Fredrickson, “Theory of polyzwitterion conformations”, J. Chem. Phys. 131 , 104901 (2009).
- R. Kumar , A. Kundagrami, and M. Muthukumar, “Counterion adsorption on flexible polyelectrolytes : comparison of theories”, Macromolecules 42 , 1370 (2009).
- R. Kumar and M. Muthukumar, “Confinement free energy of flexible polyelectrolytes in spherical cavities”, J. Chem. Phys. 128 , 184902 (2008).
- R. Kumar and M. Muthukumar, “Microphase separation in polyelectrolytic diblock copolymer melt: Weak segregation limit”, J. Chem. Phys. 126, 214902 (2007).

Book Chapter : Invited Contribution

- A. Kundagrami, R. Kumar, and M. Muthukumar. “Simulations and Theories of Single Polyelectrolyte Chains” in “Modeling and Simulation in Polymers”, edited by P.D. Gujrati and A.I. Leonov, WILEY-VCH Verlag, Weinheim, Germany, 2010.

Research Synopsis

- *Microphase separation in charged and neutral block copolymers:* We use mesoscale modeling techniques to develop a macromolecular understanding of microphase separation in block copolymers of different architectures containing charged and neutral blocks. Predictions of the models are compared with the experiments.
- *Charged and neutral polymers near interfaces:* We have developed field theoretic methods to describe the behavior of polymers near interfaces and surfaces. Furthermore, analysis tools are being developed to compute the neutron reflectivity profiles from the simulated density profiles for a direct comparison with the experiments.
- *Dielectric function for polymers:* Rigorous quantitative description of the dielectric function of inhomogeneous polymers (neutral or charged) is lacking and is a long-standing problem. We have developed mesoscopic methods to compute the dielectric function of polymers in inhomogeneous media in a self-consistent manner.
- *Dynamics of polymers in the melts:* We have carried out molecular dynamics simulations to understand the chain packing and dynamics of polymers in the melts. In particular, the effect of polymer backbone flexibility on the chain packing and the dynamics has been the focus of our research.

Graduate and Postdoctoral Advisors

Ph.D. advisor: Prof. M. Muthukumar, University of Massachusetts, Amherst, MA

Post-doctoral advisor: Prof. Glenn H. Fredrickson, University of California, Santa Barbara, CA