

Jyoti Prakash Mahalik

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SUMMARY

Highly disciplined, innovative scientist and engineer with a proven track record of applying a strong foundation of research and technical skills to deliver executable solutions to complex problems. Key achievements include recent postdoctoral experience in theoretical modeling of responsive polymer surface and molecular modeling of protein self-assembly. Recent experience in industry includes signal processing and molecular modeling of microarray and next generation genome sequencing technologies. Experience in PhD includes molecular modeling of several biophysical systems: self-assembly of virus, and DNA translocation through protein pores.

EDUCATION

PhD, University of Massachusetts, Amherst October 2012
Major: Polymer Science and Engineering, GPA: 3.88/4.00
Master of Engineering, Indian Institute of Science, Bangalore, India May 2005
Major: Chemical Engineering, GPA: 6.6/8.0
Bachelor of Technology, Indian Institute of Technology, Kharagpur, India May 2002
Major: Chemical Engineering, GPA: 7.61/10.00

RELEVANT SKILLS

Computational: Self-consistent field theory, C, C++, Java, Data structure, Perl, Matlab, Mathematica, CHARMM, GROMACS, LAMMPS, Poisson-Nernst Planck Solver, Molecular dynamics, Monte Carlo, Sequencing analysis.

Experimental: GPC, FTIR, Optical Microscopy, SALS

RESEARCH EXPERIENCE

UT-Battelle, LLC (Oak Ridge National Laboratory,) Oak Ridge TN **January 2014 - Present**

Postdoctoral Research Associate, Advisor: Dr. Bobby G. Sumpter

Self-consistent field theory of responsive polymer surface

- Modeled the role of solution pH on the polyelectrolyte planar brush profile and direct comparison was done with neutron reflectivity profile.
- Developed a theory for investigating the effect of dipolar interactions on the polymer brush profile.
- Investigated the role of chirality on the physical properties of polymer brushes.
- Discovered the self-assembly mechanism of bacterial microcompartment proteins using first of its kind coarse grain molecular modeling.

UNIVERSITY OF MASSACHUSETTS, Amherst MA

June 2013 - January 2014

Postdoctoral Research Associate, Advisor: Prof. Murugappan Muthukumar

Molecular modeling of self-assembly of polymers

- Investigated the thermodynamics of the self-assembly of PEDOT oligomers.
- Modeled the effect of polyelectrolyte architecture on its self-assembly kinetics.

UNIVERSITY OF MASSACHUSETTS, Amherst MA

January 2007 - October 2012

Research Assistant, Advisor: Prof. Murugappan Muthukumar

Numerical and molecular modeling of biophysical systems

- Discovered the role of flexible polyelectrolyte in self-assembly of virus.
- Investigated the kinetics of ejection of double stranded DNA from bacteriophage.
- Modeled the effect of site directed mutagenesis of MspA protein pore on translocation of DNA.
- Examined the applicability of the current polyelectrolyte theories in the segmental dynamics of a polyelectrolyte translocating through synthetic nanopores.
- Investigated the phase behavior of conducting polymers in ionic liquids.

INDIAN INSTITUTE OF SCIENCE, Bangalore, India
Research Assistant, Advisor: Prof. Giridhar Madras

January 2004 - May 2005

- Investigated the effect of length of alkyl group substituents on kinetics of degradation of poly (n-alkyl acrylates) by different methods (thermal, enzymatic and ultrasonic) using Gel Permeation Chromatography and population balance modeling.

INDUSTRIAL EXPERIENCE

ROCHE, 454 LIFE SCIENCES, Branford, CT, USA
Scientist I

October 2012 – June 2013

- Performed computational modeling and signal processing of DNA sequencing technologies.
- The modeling and theoretical work for next generation sequencing is documented in the form of invention disclosure (*see below*).
- Mahalik J. P., Chen Y., Suo Y., Lebov J., Wong A., "Complete stretching of ssDNA in channels for DNA sequencing" (Patent Pending).

GEOMETRIC SOFTWARE SOLUTIONS LTD, Pune, India
Software Engineer

August 2005 - July 2006

Developer of a CAD based software, CATIA used by Boeing and Airbus for design

PUBLICATIONS

- Mahalik J. P., Brown K. A., Cheng X., Cabrera M. F., "Theoretical study of the initial stages of self-assembly of a carboxysome's facet". *ACS nano* (DOI: 10.1021/acsnano.5b07805). (Accepted)
- Mahalik J. P., Yang Y., Deodhar C., Ankner J. F., Lokitz B. S., Kilbey S. M., Sumpter B. G., and Kumar R., "Monomer Volume fraction profiles in pH responsive planar polyelectrolyte brushes". *J. Polym. Sci., Part B: Polym. Phys.* (**Selected for cover page**) (Accepted)
- Mahalik J. P., Hildebrandt B. and Muthukumar M., "Langevin dynamics simulation of DNA ejection from a phage". *J Biol Physics*, 39, 229-245 (2013). (Accepted)
- Mahalik J. P. and Muthukumar M., "Langevin dynamics simulation of polymer-assisted virus-like assembly". *J Chem Phys*, 136, 135101 (2012). (**Featured in Physics today 04/09/2012, Highlighted in JCP, Top 20 most read article in JCP for July-2012, Aug-2012**). (Accepted)
- Mahalik, J. P. and Madras, Giridhar, "Enzymatic Degradation of poly (D, L-Lactide) and its Blends with poly (vinyl acetate)," *J. Appl. Polym. Sci.*, 101, 675-680 (2006). (Accepted)
- Mahalik, J. P. and Madras, Giridhar, "Effect of Alkyl Group Substituents on the Ultrasonic Degradation of Poly (n-alkyl acrylate)," *Ind. Eng. Chem. Res.*, 44, 6572-6577 (2005). (Accepted)
- Mahalik, J. P. et al, " Effect of Alkyl Group Substituents on the Thermal and Enzymatic Degradation of Poly (n-alkyl acrylate)," *Ind. Eng. Chem. Res.*, 44, 4171-4177 (2005). (Accepted)

PRESENTATIONS/POSTERS

- Planar dipolar polymer brush: field theoretical investigations, APS Meeting, Dallas, 2015
- Modeling virus assembly, Conversations in Physical and Structural Biology, Amherst, 2012
- Modeling polyelectrolyte translocation through protein channels, APS Meeting, Dallas, 2011
- Role of polyelectrolyte in the self-assembly of virus, NECF workshop, New Haven, 2011
- Role of RNA in the self-assembly of virus, APS Meeting, Pittsburgh, 2009

- Poster presentation for MRSEC at Amherst, 2008, 2009, 2010, 2011

TEACHING/MENTORING EXPERIENCE

- Mentored undergraduate students for short term summer research: 2009, 2010, and 2011
- Teaching assistant, polymer engineering lecture (grad level), September 2009 - December 2009
- Teaching assistant, polymer characterization lab (grad level), September 2007 - December 2007
- Teaching assistant, polymer synthesis laboratory (grad level), August 2004 - December 2004
- Tutored Mathematics and physics (high school level), July 2002 - May 2003

PROFESSIONAL AFFILIATIONS and HONORS

American Physical Society, New England Complex Fluid

Graduate Research fellowship, UMass Amherst, MA, September 2006 – August 2012
Computational Lab administrator, Muthu Group, UMass Amherst, MA, September 2008 – August 2012

Outreach coordinator, UMass Amherst, MA, September 2007 – August 2012