

Samanvaya Srivastava

The University of Chicago
Institute for Molecular Engineering
William Eckhardt Research Center 108
5640 South Ellis Avenue, Chicago, IL 60637

Email: samsri@uchicago.edu
<http://tirrell.ime.uchicago.edu/samsri>
Office: 773.702.7063
Cell: 607.793.0551

ACADEMIC POSITIONS

The University of Chicago, Chicago, IL

Postdoctoral Scholar, Institute for Molecular Engineering

May 2014 – present

Visiting Resident Associate, Argonne National Laboratory

Advisor: Matthew V. Tirrell

EDUCATION

Cornell University, Ithaca, NY

MS, Chemical Engineering

January 2012

Ph.D., Chemical Engineering

January 2014

Thesis: Tethered Nanoparticle–Polymer Composites: Phase Behavior, Structure, Dynamics and Rheology

Graduate committee: Lynden A. Archer (chair), Donald L. Koch, Emmanuel P. Giannelis, Itai Cohen

Indian Institute of Technology Kanpur (IIT Kanpur), Kanpur, India

Bachelor of Technology (B. Tech.), Chemical Engineering

May 2009

Master of Technology (M. Tech.), Chemical Engineering

May 2009

(Five-year B.Tech./ M.Tech. Dual degree Program)

Thesis: Electric Field Induced Patterning of Thin Liquid Films With and Without Metal Particles

Graduate committee: Ashutosh Sharma (chair), V. Shankar, Ishan Sharma

HONORS AND AWARDS

Finalist, Frank J. Padden Award, DPOLY, American Physical Society

2014

Austin Hoey Graduate Research Excellence Recognition Award, Cornell University, Chemical Eng.

2013

Best Poster Award, Fluid Mechanics, AIChE Annual Meeting

2013

emc² Young Investigator Award, Cornell University, The Energy Materials Center at Cornell (emc²)

2013

Outstanding Graduate Student Teaching Assistant Award, Cornell University, Chemical and Biomolecular Eng.

2011

Early Graduate Career Travel Fellowship, Cornell University, Chemical and Biomolecular Eng.

2011

Mattin Fellowship, Cornell University, Chemical and Biomolecular Eng.

2009

Rank 1, IIT Kanpur, Chemical Eng., class of 2008 (class size: 52)

2008

Aedunuthula Prasad Memorial Scholarship (top of the class, senior year), IIT Kanpur, Chemical Eng.

2008

Ajay Agarwal Memorial Award (top of the class, end of junior year), IIT Kanpur, Chemical Eng.

2007

IITK–NUS Student Exchange Program (awarded to six people in the institute), IIT Kanpur

2006

National Prize/Merit Certificate (top 7% of the sophomore class), IIT Kanpur

2005

PUBLICATIONS [First author publications: 11, h-index: 11, total citations: 466][‡]

*First authorship shared ‡Based on Google Scholar data

1. Gel Phase Formation in Dilute Triblock Copolyelectrolyte Complexes

S. Srivastava, M. Andreev, A. E. Levi, D. J. Goldfeld, J. Mao, W. T. Heller, V. Prabhu, J. J. de Pablo and M. V. Tirrell, *Nature Communications* 8, 14131 (2017)

2. Self-Suspended Polymer Grafted Nanoparticles

S. Srivastava, S. Choudhury, A. Agrawal and L. A. Archer, *Current Opinion in Chemical Engineering*, in print (2017).
DOI: 10.1016/j.coche.2017.04.007

PUBLICATIONS (continued)

*First authorship shared

3. Polyelectrolyte Complexation
S. Srivastava and M. V. Tirrell, *Advances in Chemical Physics* **161**, 499 (2016)
 4. Self-Assembling Peptide-Based Building Blocks in Medical Applications
H. Acar, **S. Srivastava**, E. Chung, M. R. Schnorenberg, J. C. Barrett, J. L. LaBelle and M. V. Tirrell, *Advanced Drug Delivery Reviews*, in print (2016). DOI: 10.1016/j.addr.2016.08.006
 5. Size-Dependent Particle Dynamics in Entangled Polymer-Nanocomposites
R. Mangal, **S. Srivastava**, S. Narayanan and L. A. Archer, *Langmuir* **32**, 596 (2016)
 6. Hyperdiffusive Dynamics in Newtonian Nanoparticle Fluids
S. Srivastava,* P. Agarwal,* R. Mangal, S. Narayanan, D. L. Koch and L. A. Archer, *ACS Macro Letters* **4**, 1149 (2015)
 7. Phase Stability and Dynamics of Entangled Polymer-Nanoparticle Composites
R. Mangal, **S. Srivastava**, and L. A. Archer, *Nature Communications* **6**, 7198 (2015)
 8. Dynamics and Yielding of Binary Self-Suspended Nanoparticle Fluids
A. Agrawal, H-Yu Yu, **S. Srivastava**, S. Choudhury, S. Narayanan, L. A. Archer, *Soft Matter* **11**, 5224 (2015)
 9. Structure Factor of Blends of Solvent-Free Nanoparticle–Organic Hybrid Materials: Density–Functional Theory and Small Angle X–Ray Scattering
H. Yu, **S. Srivastava**, L. Archer and D. L. Koch, *Soft Matter* **10**, 9120 (2014)
 10. 25th Anniversary Article: Polymer–Particle Composites: Phase Stability and Applications in Electrochemical Energy Storage
S. Srivastava, J. L. Schaefer, Z. Yang, Z. Tu and L. A. Archer, *Advanced Materials* **26**, 201 (2014)
 11. Structure and Transport Anomalies in Soft Colloids
S. Srivastava, S. Narayanan and L. A. Archer, *Physical Review Letters* **110**, 148302 (2013)
 12. High Energy Lithium–Oxygen Batteries: Transport Barriers and Thermodynamics
S. K. Das, S. Xu, A. H. Emwas, Y. Y. Lu, **S. Srivastava** and L. A. Archer, *Energy & Environmental Science* **5**, 8927 (2012)
 13. Polymer Nanocomposites: Polymer and Particle Dynamics
D. Kim,* **S. Srivastava**,* S. Narayanan and L. A. Archer, *Soft Matter* **8**, 10813 (2012)
Featured as *Top 10 most-read Soft Matter articles in September 2012*
 14. Tethered Nanoparticle–Polymer Composites: Phase Stability and Curvature
S. Srivastava, P. Agarwal and L. A. Archer, *Langmuir* **28**, 6276 (2012)
 15. Structure and Rheology of Nanoparticle–Polymer Suspensions
S. Srivastava, J. H. Shin and L. A. Archer, *Soft Matter* **8**, 4097 (2012)
Featured as *Top 10 most-read Soft Matter articles in January 2012*
 16. Ionic Liquid–Tethered Nanoparticle Suspensions: A Novel Class of Ionogels
S. S. Moganty, **S. Srivastava**, Y. Lu, J. L. Schaefer, S. A. Rizvi and L. A. Archer, *Chemistry of Materials* **24**, 1386 (2012)
 17. Thermal Jamming of a Colloidal Glass
P. Agarwal, **S. Srivastava** and L. A. Archer, *Physical Review Letters* **107**, 268302 (2011)
 18. Electric Field Induced Microstructures in Thin Films on Physicochemically Heterogeneous and Patterned Substrates
S. Srivastava, P. D. S. Reddy, C. Wang, D. Bandyopadhyay and A. Sharma, *J. Chemical Physics* **132**, 174703 (2010)
 19. Embedded Microstructures by Electric–Field–Induced Pattern Formation in Interacting Thin Layers
S. Srivastava, D. Bandyopadhyay and A. Sharma, *Langmuir* **26**, 10943 (2010)
- Manuscripts in preparation** (Drafts available on request)
20. Actin Encapsulation and Assembly in Polypeptide Complex Coacervates
S. Srivastava, P. M. McCall, S. L. Perry, D L. Kovar, M. L. Gardel and M. V. Tirrell, *in prep.*
 21. Mapping the Structural Morphologies of Polyelectrolyte Complex Hydrogels
S. Srivastava, A. E. Levi, D. J. Goldfeld, N. Chavez and M. V. Tirrell, *in prep.*

RESEARCH EXPERIENCE

The University of Chicago, Institute for Molecular Engineering

May 2014 – present

Structure, Rheology and Applications of Polyelectrolyte Complex Based Hybrid Materials

- Investigating the structure, rheology and assembly kinetics of polyelectrolyte complex (PEC) hydrogels using various scattering techniques (SLS, SAXS, SANS, DLS, and XPCS) and rheometry.
 - Preparing an extensive structure map and elucidating morphology transitions of PEC hydrogel.
 - Developing a comprehensive structure-property relationship database for PEC hydrogels.
- Discovered a novel gel phase formation in complexation-driven assembly of triblock copolyelectrolytes.
 - Investigated assembly of copolyelectrolytes at very low concentration using scattering experiments and MD simulations, in collaboration with the de Pablo group.
 - Illustrated the assembly mechanism of polyelectrolyte complexation-driven assemblies.
- Elucidated the mechanism of Actin encapsulation and assembly in PEC coacervates in collaboration with the Gardel group.
 - Examined the role of PEC coacervates in enhancing the Actin assembly rates.
 - Illustrated the feasibility of reversible Actin assembly in presence of PEC coacervates and its effects on the properties of the coacervate droplets.

Cornell University, School of Chemical and Biomolecular Engineering

August 2009 – March 2014

Tethered Nanoparticle/Polymer Composites – Phase Behavior, Structure, Dynamics and Rheology

- Designed and synthesized polymer grafted nanoparticles with varying polymer molecular weight, nanoparticle volume fraction and various polymer chemistries.
- Constructed a *phase diagram* for soft nanoparticle/polymer composites.
- Discovered unique properties of soft nanoparticle suspensions, including:
 - A novel *jammed – yet – equilibrated* state, in contrast to the contemporary understanding of jammed suspensions.
 - Anomalous structural and dynamic properties, making them ideal systems for studying complex molecules like water.
 - Unusual *non – Einsteinian* macroscopic flow behavior coexisting with conventional flow behavior at the nano scale.
- Developed a theoretical framework to elucidate atypical faster – than – diffusion relaxation mechanisms in soft glasses.
- Discovered a method to predict extremely long time flow behavior of jammed suspensions through lab-scale measurements.
- Employed numerical simulations to corroborate experimental flow behavior of soft glasses, including non-linear viscoelastic flow behavior and long-time flow behavior (time – strain superposition).

Indian Institute of Technology Kanpur, Department of Chemical Engineering

January 2008 – May 2009

Electric field induced patterning of thin liquid films

- Extended a continuum based electrohydrodynamic model and performed numerical simulations to describe the interfacial deformations of thin liquid polymer films under the influence of an externally applied electric field.
 - Designed a strategy to self-assemble a pair of polymer films into micro-channels and other intricate patterns.
 - Elucidated the pattern formations in thin films placed on a variety of physiochemically rough substrates.

TEACHING AND ADVISING

Research Advisor, The University of Chicago, Institute for Molecular Engineering

2014 – present

Guiding research projects for two Ph.D. and four undergraduate students

Research Advisor, Cornell University, School of Chemical and Biomolecular Engineering

2010 – 2014

Guided research projects for five graduate (1 M.S., 2 M.Eng., 2 Ph.D.) and two undergraduate students

Teaching Assistant, Cornell University CHEME 3230 Fluid Mechanics (undergraduate major requirement)

2012

Designed and taught recitations, held office hours, graded exams and managed three undergraduate and one Ph.D. TAs

Teaching Assistant, Cornell University CHEME 3240 Heat and Mass Transfer (undergraduate major requirement)

2011

Designed and taught recitations, held office hours, designed homeworks and exams and managed four undergraduate TAs

Teaching Assistant, Cornell University CHEME 3240 Heat and Mass Transfer (undergraduate major requirement)

2010

Designed and taught recitations, held office hours, designed quizzes and managed three undergraduate TAs

Awarded the *Outstanding Graduate Student Teaching Assistant for the academic year 2010-2011*

CONFERENCES AND SEMINARS

Invited

1. Actin Encapsulation and Assembly in Polypeptide Complex Coacervates
S. Srivastava, M. L. Gardel, M. V. Tirrell et al, ACS National Spring Meeting, San Francisco, April 2017
2. Polyelectrolyte Complexation Driven Self-Assemblies
S. Srivastava and M. V. Tirrell, University of Illinois at Chicago, Department of Chemical Eng., Chicago, November 2016
3. Polyelectrolyte Complexation Driven Self-Assemblies
S. Srivastava and M. V. Tirrell, University of Massachusetts Amherst, Dept. of Polymer Science and Eng. and Dept. of Chemical Eng., Muthukumar Group, Dubin Group and Perry Group, Amherst, August 2016
4. Complexation Driven Block Copolyelectrolyte Self-Assembly
S. Srivastava and M. V. Tirrell, SAXS Special Interest Group, APS, Argonne National Laboratory, Argonne, April 2016
5. Block Copolyelectrolyte Hydrogels: Structure and Flow Properties
S. Srivastava and M. V. Tirrell, User Science Seminar, APS, Argonne National Laboratory, Argonne, July 2015
6. Hyperdiffusive Relaxations in Equilibrated Soft Materials
S. Srivastava and L. A. Archer, Polymer Physics Gordon Research Seminar, South Hadley, July 2014
7. The Origin of Hyperdiffusive Relaxations in Soft Matter
S. Srivastava, Padden Award Symposium, Annual Meeting of the American Physical Society, Denver, March 2014
8. Tethered Nanoparticle – Particle Composites: Rheology, Structure and Dynamics
S. Srivastava, University of Illinois at Chicago, Department of Chemical Eng., Sharma Group, Chicago, March 2014

Contributed

9. Polyelectrolyte Complexation Driven Self-Assembly
S. Srivastava, J. J. de Pablo, M. V. Tirrell et al, Annual Meeting of AIChE, San Francisco, November 2016
10. Complexation Driven Block Copolyelectrolyte Self-Assembly
S. Srivastava, J. J. de Pablo, M. V. Tirrell et al, ACS Colloid & Surf. Sci. Symposium, Boston, June 2016
11. Self-Assembly in Polyelectrolyte Complex Hydrogels
S. Srivastava and M. V. Tirrell, Annual Meeting of the American Physical Society, Baltimore, March 2016
12. Polyelectrolyte Complex Hydrogels: Structure and Flow Properties
S. Srivastava, A. Levi, M. V. Tirrell et al, Annual Meeting of AIChE, Salt Lake City, November 2015
13. Structure and Flow Properties of Block Copolyelectrolyte Hydrogels
S. Srivastava, A. Levi, M. V. Tirrell et al, ACS Colloid & Surf. Sci. Symposium, Pittsburgh, June 2015
14. Structure and Flow Properties of Block Copolyelectrolyte Hydrogels
S. Srivastava and M. V. Tirrell, Annual Meeting of the American Physical Society, San Antonio, March 2015
15. The Origin of Hyperdiffusive Relaxations in Soft Glasses
S. Srivastava and L. A. Archer, Annual Meeting of AIChE, San Francisco, November 2013
16. Time – Strain Superposition in Soft Glasses
S. Srivastava and L. A. Archer, 85th Annual Meeting of The Society of Rheology, Montreal, October 2013
17. Interactions and Relaxation Processes in Nano-Colloidal Suspensions
S. Srivastava and L. A. Archer, ASME-AMD Annual Summer Meeting, Providence, July 2013
18. Structure and Transport Anomalies in Soft Colloids
S. Srivastava and L. A. Archer, Annual Meeting of the American Physical Society, Baltimore, March 2013
19. Tethered nanoparticle–polymer composites: Structure, dynamics and rheology
S. Srivastava and L. A. Archer, 84th Annual Meeting of The Society of Rheology, Pasadena, February 2013
20. Nanoparticle Polymer Composites: Structure and Rheology
S. Srivastava and L. A. Archer, Annual Meeting of the American Physical Society, Boston, March 2012
21. Nanoparticle Polymer Composites: Structure and Rheology
S. Srivastava and L. A. Archer, 83rd Annual Meeting of The Society of Rheology, Cleveland, October 2011
22. Nanoparticle Organic Hybrid Suspensions: Structure and Rheology
S. Srivastava and L. A. Archer, Annual Meeting of the American Physical Society, Dallas, March 2011

SELECTED POSTER PRESENTATIONS

1. The Origin of Hyperdiffusive Relaxations in Soft Glasses
S. Srivastava, D. L. Koch and L. A. Archer, Annual Meeting of AIChE, San Francisco, November 2013
 Awarded the *Best Poster Award in the Area of Fluid Mechanics*
2. Actin Encapsulation and Assembly in Polypeptide Complex Coacervates
S. Srivastava, P. M. McCall, S. L. Perry, D L. Kovar, M. L. Gardel and M. V. Tirrell, EMBO Workshop on Macromolecular Assemblies at the Junction of Cell Stress and Function, Jerusalem, Israel, May 2015

TECHNICAL EXPERTISE

<i>Synthesis</i>	<ul style="list-style-type: none"> • Monomer Preparation • Anionic Polymerization • Atom-transfer Radical Polymerization 	<ul style="list-style-type: none"> • Inorganic Nanoparticle Synthesis and Functionalization • Click Chemistry Techniques • Solid-state Peptide Synthesis
<i>Physical Characterization</i>	<ul style="list-style-type: none"> • Rheometry • Small Angle X-ray Scattering • Small Angle Neutron Scattering • X-ray Photon Correlation Spectroscopy • Ultra-small Angle X-ray Scattering • Static and Dynamic Light Scattering 	<ul style="list-style-type: none"> • Differential Scanning Calorimetry • Thermogravimetric Analysis • Size exclusion Chromatography • Nuclear Magnetic Resonance • UV/Vis Spectroscopy • Circular Dichroism
<i>Microscopy</i>	<ul style="list-style-type: none"> • (Cryo)Transmission Electron 	<ul style="list-style-type: none"> • (Cryo)Microtomy
<i>Applications</i>	<ul style="list-style-type: none"> • MATLAB 	<ul style="list-style-type: none"> • Mathematica

PROFESSIONAL EXPERIENCE

Postdoctoral Scholar , The University of Chicago, Institute for Molecular Engineering	2014 – present
Postdoctoral Researcher , Cornell University, School of Chemical and Biomolecular Engineering	2014
Graduate Research Assistant , Cornell University, School of Chemical and Biomolecular Engineering	2009 – 2014
Graduate Resident Fellow , Cornell University, William Keeton House	2010 – 2013
Graduate Teaching Assistant , Cornell University, School of Chemical and Biomolecular Engineering	2010 – 2012
Graduate Research Assistant , IIT Kanpur, Department of Chemical Engineering	2008 – 2009
Coordinator and Teacher , Opportunity School (an evening school for adults), IIT Kanpur	2008 – 2009
Summer Internship , Bayer Technology Services, Leverkusen, Germany	2007
Student Exchange Program , National University of Singapore, Singapore	2006

PROFESSIONAL TRAINING

Polymer Nanocomposites: Challenges and Opportunities, APS Annual Meeting, March 2016

A short course on structure, dynamics and processing of polymer nanocomposites, as well as future potential and challenges in design of multi-functional materials

“Beyond Rg” Small Angle Scattering Short Course, Argonne National Laboratory, October 2015

A workshop focused on the theory, design, and use of X-ray and neutron scattering experiments

The glass transition in polymers, small molecule glass formers, and colloids: Recent advances in theory, experiment, and open challenges, APS Annual Meeting, March 2015

A short course on theories of glasses, the fundamental phenomenology of the glass transition and practical applications of polymer glasses

Advances in Scattering Techniques: Theory and Applications in Polymer Physics, APS Annual Meeting, March 2011

The workshop on elastic and inelastic X-ray and neutron techniques as probes for the structure and dynamic processes in polymer systems on broad length scales

REVIEW CONTRIBUTIONS

Physical Review Letters, Science Advances, ACS Macro Letters, Macromolecules, Soft Matter, Advances in Colloid and Interface Science, Journal of Physical Chemistry, Journal of Materials Chemistry C, Soft Matter, Annalen der Physik, Polymer, Journal of Rheology, Physical Chemistry Chemical Physics, IEEE Transactions in Nanotechnology

ACADEMIC SERVICE AND OUTREACH

- Coordinator**, CHiMaD Use-Case Group Meeting, Tirrell Group, The University of Chicago 2014 – present
Organize monthly meetings with participants from U. Chicago, Northwestern U. & NIST
- The Art of Science Presentations**, University of Illinois at Chicago, Department of Chemical Eng., Chicago July 2016
Engaged engineering undergraduate and graduate students in an interactive seminar on scientific presentations
- A Primer on Scientific Writing**, University of Illinois at Chicago, Department of Chemical Eng., Chicago June 2015
Mentored chemical engineering undergraduate and graduate students on scientific writing
- Graduate Resident Fellow**, William Keeton House, Cornell University 2011 – 2013
Mentored student development, community building and provided academic as well as well-being support and counseling to more than 300 undergraduate student residents
- Coordinator**, Rheology Group Meeting, Cornell University 2012 – 2013
Organized biweekly research meetings to discuss progress among various groups involved in soft matter research in different departments at Cornell University
- Coordinator and Teacher**, Opportunity College, IIT Kanpur 2008 – 2009
Administered the proceedings and taught basic computer applications course at an evening adult school aimed at providing computer and technical literacy to science and arts graduate and post-graduates

REFERENCES

Matthew V. Tirrell

Institute for Molecular Engineering
The University of Chicago, Chicago, Illinois 60637
Email: mtirrell@uchicago.edu
Phone: 773.834.2001

Juan J. de Pablo

Institute for Molecular Engineering
The University of Chicago, Chicago, Illinois 60637
Email: depablo@uchicago.edu
Phone: 773.702.7791

Lynden A. Archer

School of Chemical and Biomolecular Engineering,
Cornell University, Ithaca, New York 14853
Email: laa25@cornell.edu
Phone: 607.254.8825

Donald L. Koch

School of Chemical and Biomolecular Engineering,
Cornell University, Ithaca, New York 14853
Email: dlk15@cornell.edu
Phone: 607.255.3484