

Shensheng Chen, Ph.D.

Postdoc at California Institute of Technology, Chemical Engineering

Caltech

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👤 Shensheng Chen

Education & Professional Appointment

- 2021.03 – now **Postdoc, Chemical Engineering, California Institute of Technology**
Advisor: Prof. Zhen-Gang Wang
Research direction: *Simulation and theory of polyelectrolyte complex coacervation*
- 2016.09 – 2020.12 **PhD, Mechanical Engineering, Binghamton University, State University of New York (SUNY)** Advisor: Prof. Xin Yong
Thesis title: *Mesoscale simulation of polymer gels and polymer nanocomposites.*
- 2010.08 – 2014.07 **BS, Mechanical Engineering, Shanghai Jiao Tong University**

Proposal Writing Experiences

Successful grant proposals, (Co-PI and the primary proposal writer)

- 2023 **2.5M hours transferable computational time (\approx \$75 000), funded by Brookhaven National Laboratory.**
Proposal received the highest rating from all three reviewers.
- 2021 **2.0M hours computational time (\approx \$50 000), funded by Brookhaven National Laboratory.**

Research Publications

Journal Articles (10 first author, 1 co-first author, 2 co-author)

- S. Chen** and Z.-G. Wang, “Charge Asymmetry Suppresses Coarsening Dynamics in Polyelectrolyte Complex Coacervation”, [article link]
Physical Review Letters, 2023, [Editors' Suggestion](#)
- S. Chen** and Z.-G. Wang, “Using Implicit-Solvent Potentials to Extract Water Contributions to Enthalpy–Entropy Compensation in Biomolecular Associations”, [article link]
The Journal of Physical Chemistry B, 2023
- S. Chen** and Z.-G. Wang, “Driving force and pathway in polyelectrolyte complex coacervation”, [article link],
Proceedings of the National Academy of Science, 2022, [Media coverage by kudos-PNAS](#), [5 invited talks](#)
- S. Chen**, P. Zhang, and Z.-G. Wang, “Complexation between Oppositely Charged Polyelectrolytes in Dilute Solution: Effects of Charge Asymmetry”, [article link]
Macromolecules, 2022
- S. Chen** and X. Yong, “Viscoelastic necking dynamics between attractive microgels”, [article link]
Journal of Colloid and Interface Science, 2022
- S. Chen** and X. Yong, “Elastocapillary interactions of thermoresponsive microgels across the volume phase transition temperatures”, [article link]
Journal of Colloid and Interface Science, 2021
- S. Chen**, E. Olson, S. Jiang, and X. Yong, “Nanoparticle assembly modulated by polymer chain conformation in composite materials”, [article link]
Nanoscale, 2020
- Y. Li, **S. Chen (co-first author)**, S. Demirci, et al., “Morphology evolution of Janus dumbbell nanoparticles in seeded emulsion polymerization”, [article link]
Journal of Colloid and Interface Science, 2019, [Selected as journal cover](#)
- S. Chen** and X. Yong, “Janus Nanoparticles Enable Entropy-Driven Mixing of Bicomponent Hydrogels”, [article link]

Langmuir, 2019

10. **S. Chen** and X. Yong, "Dissipative particle dynamics modeling of hydrogel swelling by osmotic ensemble method", [article link]
The Journal of Chemical Physics, 2018
11. L. Lei, **S. Chen**, C. J. Nachtigal, T. F. Moy, X. Yong, and J. P. Singer, "Homogeneous gelation leads to nanowire forests in the transition between electrospray and electrospinning", [article link]
Materials Horizons, 2020
12. Y. Li, F. Liu, **S. Chen**, et al., "Self-stratification of amphiphilic Janus particles at coating surfaces", [article link]
Materials Horizons, 2020, [Selected as journal cover](#)

Preprints:

1. **S. Chen** and T. Zhou, "Polyelectrolyte Knot Delocalization Induced by Counterion Condensation", [article link]
arxiv, 2023

Student Awards

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|-------------|---|---|
| 2020 | 📌 | Graduate Student Award for Academic Excellence in Research 2020. Binghamton University |
| 2018 & 2019 | 📌 | Travel Grants, APS March Meeting |
| 2014 | 📌 | First Prize of Technical Innovation Competition Award. Shanghai Jiao Tong University (Top 1%) |

Teaching & Mentoring

Students mentoring

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|-----------|---|--|
| 2022-2023 | 📌 | Benjamin Ye , Graduate student in California Institute of Technology, Chemical Engineering |
| 2021-2022 | 📌 | Sara Vanovac , Graduate student in California Institute of Technology, Chemical Engineering |
| 2019-2020 | 📌 | Tyler F Moy , Undergraduate student in binghamton university, Mechanical Engineering |
| 2018-2019 | 📌 | Rebecca Schneider , Undergraduate student in binghamton university, Mechanical Engineering |

Teaching in undergraduate and graduate class

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|------|---|---|
| 2017 | 📌 | Analytical Methods , Applied Math in Engineering Problems for undergraduates |
| 2019 | 📌 | Introduction to Machine Learning , First principles ML course for undergraduates & grads |
| 2020 | 📌 | Engineering Programming , Matlab programming coding class for undergraduates |

Research Experiences

Postdoc at California Institute of Technology, Zhen-Gang Wang group, 2021.03-now

- Developing computational and theoretical framework to resolve long-standing controversies in thermodynamics of liquid-liquid phase separation systems.
- Elucidating electric-field driven structure and dynamics of electric-responsive polymer systems in bulk and at interfaces, to guide the design of electro-actuated polymer soft robotics.

Research assistant at Binghamton University, Yong group, 2016-2020

- Developing coarse-grained simulation methods to simulate hydrogel swelling in experimental conditions.
- Elucidating elastocapillary interactions of thermoresponsive microgels across volume phase transition temperatures.
- Employing machine learning in combination with molecular dynamics for the accurate prediction of structure-properties relationship in polymer nanocomposites.

- Guiding experimental design of polymer composite films by using simulations to show how particle assembly can be modulated by polymer chain conformation in composite materials.

Selected Conference Proceedings

- “Harnessing Water Entropy And Electric Field To Design Aqueous Polymer Systems For Sustainability And Bioengineering”, Meet the Faculty and Post-Doc Candidates Poster Session, Florida, 11/2023.
- “Water Reorganization Drives Liquid—Liquid Phase Separation”, ALChE, Faculty candidate talk, Florida, 11/2023.
- “Solvent reorganization leads to enthalpy–entropy compensation in biomolecular recognition”, American Physical Society (APS) March meeting, Las Vegas, 03/2023.
- “Driving force and pathway in polyelectrolyte complex coacervation”, 2022 AIChE Annual Meeting in Phoenix, AZ. 11/2022.
- “Modelling Nanowire Formation in Electrospray Deposition of Polymeric Droplets”, American Physical Society (APS) March meeting. (Virtual), 03/2020.
- “Mesoscale modeling of polymer bigels using Janus particles”, American Physical Society (APS) March meeting. Boston, MA, 03/2019.
- “Mesoscale Modeling of Swelling Kinetics of Hydrogels”, American Physical Society (APS) March meeting. LA, CA, 03/2018.

Media Coverage

- “Chen and Wang in Caltech found water entropy drives charged polymers assembly in water” [kudos-PNAS](#)
- “Research shows potential to improve paints, coatings”, [ScienceDaily](#) , [EurekaAlert](#), [Phys.org](#), [PaintSquar](#), [New Atlas](#)

Skills

Languages	📖 English and Mandarin Chinese.
Coding	📖 C++, C, Python, Matlab, \LaTeX , ...
MD Simulation packages	📖 LAMMPS, Gromacs, Fluent, OpenMM, ...
Simulation method	📖 Dissipative particle dynamics, molecular dynamics, classical density functional theory, Brownian dynamics, atomistic simulation, quantum-based simulation, umbrella sampling ...
Others	📖 Machine learning, HPC computing, Slurm, Open MPI ...

Academic & Community Service

Guest Editor	📖 Edit Special issue in journal <i>Gels</i> Special issue: “Dynamics of polymer gels”
	📖 Edit Special issue in journal <i>Crystals</i> Special issue: “Janus Particles”
Topical Advisory Panel	📖 Topical Advisory Panel in journal <i>Polymers</i>
Journal Reviewer	📖 <i>PNAS, Macromolecules, Polymers, ACS Macro Letters, Soft Matter, Plus one, Langmuir, Gels, Molecules, Journal of Dispersion Science and Technology, Life, Industrial & Engineering Chemistry Research, Molecular Simulation</i>