

William Forrest Drayer

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EDUCATION

UNIVERSITY OF SOUTH FLORIDA

2018–2023

- Ph.D., Chemical Engineering
 - Dissertation title: Dynamical Polymer Chain Heterogeneities and Their Impacts on the Glass Transition

UNIVERSITY OF AKRON

2013–2018

- B.A., Multidisciplinary Studies
 - Primary concentration: Mathematics
 - Secondary concentration: Physical Chemistry
 - Minors: Polymer Science and Engineering; Music

WORK

UNIVERSITY OF PENNSYLVANIA

2023–PRESENT

School of Engineering and Applied Science; Materials Science and Engineering

Postdoctoral Researcher

- Investigating hydroxide solvation and transport in precise polymers for applications as ionic exchange membranes
- Refined calculations of structure factor to obtain experimental agreement
- Created a forcefield for simulating new precise polymers with experimental analogues
- Supervised three undergraduate researchers

UNIVERSITY OF SOUTH FLORIDA

2018–2023

Department of Chemical, Biological, and Materials Engineering

Teaching Associate; Research and Teaching Assistant

- Lead instructor for Thermodynamics I (Fall 2022)
- Teaching assistant for three semesters of thermodynamics (I and II)
- Molecular dynamic simulation of glasses (primarily polymers) investigating the glass transition
 - Extensive use of distributed computing (SLURM, Bash, C++)
 - LAMMPS simulation of systems such as bead-spring and all-atom (co-)polymers
 - Data analysis and visualization using Excel, Python, Julia, MATLAB, Mathematica, and others
 - Project development and management with Git/Github

UNIVERSITY OF AKRON

2015–2018

Department of Polymer Engineering; Undergraduate Research

- Simulated and analyzed relaxation behavior of bead-spring copolymers (primary software: LAMMPS, Python)

Department of Corrosion Engineering; Research Assistant

- Developed a capsule-embedded coating simulation code in Python (Anaconda)
- Simulated coating damage and analyzed self-healing performance for use in anti-corrosive coatings

Ballistic Impact Lab; Research Assistant

- Refabricated Hopkinson tube for high-speed impact measurements
- Selected and installed strain gauge and appropriate adhesive
- Prepared ballistic gelatin for impact testing
- Operated high-speed impact data collection

PUBLICATIONS AND CONFERENCES

PUBLICATIONS

- In Prep Enhanced Transport and Mechanical Properties of Fluorine-Free Random Copolymers Achieved at Optimal Sulfonation Levels; Sol Mi Oh, Victoria Lee, William F. Drayer, Max S. Win, Courtney M. Leo, Emily Grumbles, Justin G. Kennemur, Amalie L. Frischknecht, Karen I. Winey
- In Prep Investigating Aqueous Dynamics and Channel Structure in Simulations of Anion Exchange Membranes with Precise Polymers; William F. Drayer, Emily M. Duan, James C. Johnson, Karen I. Winey, Amalie L. Frischknecht
- In Prep Evidence for Two Mechanisms for Molecular Weight Effects on the Glass Transition Temperature; William F. Drayer and David S. Simmons
- 2024 Is the Molecular Weight Dependence of the Glass Transition Temperature Caused by a Chain End Effect?; William F. Drayer and David S. Simmons; DOI: 10.1021/acs.macromol.4c00419
- 2023 Interplay between Dynamic Heterogeneity and Interfacial Gradients in a Model Polymer Film; Austin D. Hartley, William F. Drayer, Asieh Ghanekarade, and David S. Simmons; DOI: 10.1063/5.0165650
- 2022 Sequence Effects on the Glass Transition of a Model Copolymer System; William F. Drayer and David S. Simmons; *Macromolecules* 2022 55 (14), 5926-5937; DOI: 10.1021/acs.macromol.2c00664

PRESENTATIONS

- 2024 Drayer, W. and Simmons, D. Evidence for Two Mechanisms Driving Molecular Weight Dependence of the Glass Transition Temperature in Linear Polymers. In APS March Meeting Abstracts (Vol. 2024, pp. D32.00007).
- 2023 Drayer, W. and Simmons, D. Mechanistic Origins of Glass Transition Dependence on Molecular Weight in Linear Homopolymers. In APS March Meeting Abstracts (Vol. 2023, pp. K23.00005).
- 2022 Drayer, W. and Simmons, D. Computational Insights into the Molecular Origins of the Chain Length Dependence of Polymers' Glass Transition. In APS March Meeting Abstracts (Vol. 2022, pp. Y16.008).
- 2021 Drayer, W. and Simmons, D. Sequence Effects on the Glass Transition-Suppression from Block to Alternating Copolymers. In APS March Meeting Abstracts (Vol. 2021, pp. S08-005).
- 2019 Drayer, W. and Simmons, D. Polymer chain sequence effects on the glass transition. In APS March Meeting Abstracts (Vol. 2019, pp. P54-001).

POSTERS

- 2024 William F. Drayer, Emily Duan, James Johnson, Karen I. Winey, Amalie L. Frischknecht. Nanoscale Structure and Water Dynamics in Precisely Quaternized Polymers; Polymer Physics GRC

TECHNICAL PROFICIENCIES

Programming Languages:

Julia	Python	Bash	Powershell
C++	Mathematica	MATLAB	Java

Technical Software Experience:

Git (Github) | CUDA (C & Julia) | LAMMPS | SLURM | VMD | Anaconda (Python Suite)

AWARDS AND OTHER WORK EXPERIENCE

Selected Awards:

- USF Outstanding Teaching Assistant Award (2022)
- USF Outstanding Departmental Contribution Award (2021)
- University of Akron President's List (6 semesters)
- University of Akron Dean's List (10 semesters)
- Richard L. Waldman, Jr. Scholarship (Fall 2018)
- Greater Cleveland Automobile Dealers Association Scholarship Recipient (thrice; 2014-2016)

Professional Bassoonist:

- Canton Concert Band, 2012-2018
- Alliance Symphony Orchestra, Spring 2012-Spring 2014, Spring 2018
- University of Akron, Fall 2013-Spring 2017
- Ohio Band Director's Conference, Spring 2016
- Kent State Stark Band, Spring 2012-Spring 2014

Laborer:

- Groundskeeping (2012-2014)
 - Sanctuary Golf Course (bunker maintenance and repair, mowing, edge-trimming, greenskeeping, etc.)
 - University of Akron (landscape maintenance)
- Farmhand (Summer 2011)