Pierre Kawak

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Education

Brigham Young University (BYU) — Ph.D, Chemical Engineering — 2017 – 2022
Funded Assistantship; 3.81 GPA — *Advisor: Douglas R. Tree*
Dissertation: Simulation of Crystal Nucleation in a Polymer Melt

American University of Sharjah (AUS) — M.S. Chemical Engineering — 2015 – 2017
Full Scholarship; 4.0 GPA — *Advisor: Ghaleb A. Husseini*
Dissertation: Ultrasound Triggered Release of Estrone-Targeted Liposomes

American University of Sharjah (AUS) — B.S. Chemical Engineering — 2010 – 2015
Partial Scholarship — Minor Economics

Research Experience

Copolymer Sequence Specific Effects on Glass Transition (Tg) with David S. Simmons — 2022 – Present
Expertise: Atomistic Simulations, Vitrification, Copolymer Theory
- Identify, create, and simulate atomistic copolymer with specified sequences to tune Tg
- Analyze segmental and chain dynamics of automated quench simulations to calculate Tg
- Develop/maintain team-wide simulation/analysis software suites

Molecular Origins of Polymer Nanocomposite Toughness (PNC) with David S. Simmons — 2022 – Present
Expertise: Nonequilibrium MD, Rouse Modes Analysis, Polymer Viscoelasticity, Stress Dissipation
- Develop equilibrium (eq.) & non-eq. LAMMPS MD simulators to study rheology of filled rubber (PNCs)
- Analyze nonlinear rheological response via local & global metrics to identify nanoscale toughness origins

GPU Accelerated Polymer Crystal Simulation with Douglas R. Tree — 2017 – 2022
Expertise: Free Energy Analysis, Morphology Analysis, Nucleation Theory, High Performance Computing
- Develop and maintain 2 molecular simulators to study coarse-grained polymers
- Evaluate progress of and exposed trends in crystallization by employing varied order parameters

Ultrasound-sensitive smart drug delivery systems with Ghaleb Husseini — 2014 – 2017
Expertise: Liposomes, Chemotherapy, Drug Delivery, Surface Modification, Breast Cancer, Ultrasound
- Synthesize, validate and test novel nanoparticle carrier for treatment of breast cancer cells
- Develop/modernize team-wide lab protocols

Publications

[3] Pierre Kawak, Christopher Akiki, and Douglas Tree. "The effect of local chain stiffness on the mechanism of crystal nucleation in an oligomer melt" (2024). DOI: 10.26434/chemrxiv-2023-374qx.

[2] Pierre Kawak, Dakota S. Banks, and Douglas R. Tree. "Semiflexible oligomers crystallize via a cooperative phase transition". *Journal of Chemical Physics* 155 (2021), p. 214902. DOI: 10.1063/5.0067788.

[1] Najla M. Salkho, Vinod Paul, Pierre Kawak, Rute F. Vitor, Ana M. Martins, Mohammad Al Sayah, and Ghaleb A. Husseini. "Ultrasonically controlled estrone-modified liposomes for estrogen-positive breast cancer therapy". *Artificial Cells, Nanomedicine, and Biotechnology* 46 (2018), pp. 462–472. DOI: 10.1080/21691401.2018.1459634.

In Progress Publications

[4] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Relaxation Processes in a Deformed Polymer Nanocomposite Visualized by Spatially Resolved Molecular Dynamics" (in preparation).

[3] David S. Simmons and Pierre Kawak. "Amorphous Molecular Dynamics Analysis Toolkit (AMDAT)" (in preparation).
[2] Douglas R. Tree and Pierre Kawak. "The Search for a Molecular-Level Understanding of Nucleation in Polymer Crystallization" (in preparation).
[1] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Central role of filler-polymer interplay in nonlinear reinforcement of elastomeric nanocomposites". *In Review* (2023). DOI: 10.48550/arXiv.2310.18433.

Awards and Fellowships

NSF CoPI Discover ACCESS (MAT230074) Compute Resource Grant		Nov. 2023
National Postdoctoral Association (NPA) IMPACT Fellowship	$1000	2023 – 2024
NSF and SACNAS Grant Writing Workshop Attendance		Aug. 2023
Future Faculty Workshop Diverse Leaders for the Future Workshop Attendance		June 2023
USF Annual Postdoctoral Research Symposium Best Poster Award	$200	Mar. 2023
APS Career Mentor Fellowship		2023
AUS College of Engineering Hall of Fame Inductee		2023
BYU Chemical Engineering Department Graduate Student of the Month		Sept. 2022
APS Forum on International Physics Distinguished Student Award	$300	Fall 2022
BYU University Accessibility Center Banquet Scholarship Award	$1500	Fall 2021
BYU Graduate Student Society Professional Presentation Award	$500	Fall 2021
BYU Chemical Engineering Department Travel Award	$500	Fall 2021
Delta Alpha Pi (DAPi) International Honor Society Inductee		2021
Fully-funded attendance of oSTEM Professional Development Summit		Mar. 2021
UCSD SDSC High Performance Computing Summer Institute Attendee		Jul. 2018
AUS Biomedical Engineering Symposium Best Overall Talk Award	$700	Fall 2016
AUS 3× Dean's List for Academic Excellence		2013 – 2014

Research Mentorship Experience

Alyna Williams USF UG	Amanda Sharrer USF Ph.D.	Luiz Zepeda USF Ph.D.	Harshad Bhapkar USF Ph.D.	Peijing Yue USF Ph.D.
Makayla Branham USF Ph.D.	William F. Drayer USF Ph.D.	Bao Ma USF Ph.D.	Annelise Curtin USF M.S.	Austin Hartley USF UG
Dakota S. Banks BYU UG	Christopher Akiki BYU UG	Beverly S. Delgado BYU UG	Andrew S. Gibson BYU UG	Paul Kawak AUS UG

Teaching Experience

Graduate Teaching Assistant *Brigham Young University*	Thermodynamics Separations Engineering Heat & Mass Transfer Process Dynamics & Control	Winter 2021 Fall 2021 2018 – 2021 (3x) Fall 2018
Volunteer Course Instructor; *University of the People*	College Algebra	Spring 2018
Graduate Instructor; *American University of Sharjah*	Principles of ChemE	2016 – 2017 (3x)
Graduate Teaching Assistant	Corrosion Lab	2016 – 2017 (2x)

American University of Sharjah	ChemE Lab I	2015 – 2016 (2x)
	Graduate Desalination	Spring 2015
	Wastewater Treatment	Spring 2015
Undergraduate Teaching Assistant	Mass Transfer	2014 – 2015 (3x)
American University of Sharjah	Kinetics	Fall 2014
	Thermodynamics	Spring 2014
Private Tutor	Maths, Engineering, Business, etc.	2008 – now

Community and Service

American Physical Society (APS)

Member of Division of Polymer Physics (DPOLY) Membership Committee	2024-2025
Organizer of DPOLY March Meeting Focus Session "Polymer Structure and Dynamics across Multiple Length and Timescales"	Mar 2024, 2025
Organizer and Winner of DPOLY T-Shirt Design Competition	Mar 2024
Physicists To-Go Public Engagement Program Participant	2022 – present
Career Mentoring Fellow	2022 – 2023
DPOLY Executive Committee Early Career Member-at-Large Nomination & Candidacy	2022, 2023
2023 March Meeting Session Chair "Polymers and Polymer Composites for Energy Storage and Conversion Applications I"	Mar 2023
Forum on Diversity and Inclusion (FDI) Executive Committee Candidacy	2022
Forum of Graduate Student (FGSA) Affairs Executive Committee Candidacy	2021

Early Career Researchers in Polymer Physics

Administrator of 550 member slack channel dedicated to collaboration and networking	2022 – present
Cofounder and Organizer of Self-Development Seminar series	2022 – present
Organizer of 2023 Virtual Polymer Physics Symposium with 150 Global Attendees	Aug 2023

University of South Florida (USF) Postdoctoral Scholar Association (PSA)

Founded and Chaired PSA executive committee at USF	2023 – present
Organized Initiatives for Postdocs (Postdoc Highlight Interviews, Socials, Orientations)	2023 – present
Organized Inaugural ELEVATE Talk Series (6 Talks from Local Postdocs on Research Skills, e.g., Writing With AI, Networking Best Practices, etc.)	2024 – 2025

American Society for Engineering Education (ASEE)

Member of ASEE LGBTQ+ Advocacy in STEM Virtual Community of Practice	2022 – present
Facilitator of Trans Allyship Safe Zone Ally Training Workshop	Mar. 2023

Out in Science Technology Engineering and Mathematics (oSTEM), Inc.

Table Representative at MAA MathFest 2023	Aug 2023
Scholarship Coordinator	2023 – present
Scholarship Review Volunteer	2022 – present
Annual Conference Volunteer and Organizer	Nov. 2022
Annual Conference Merchandise Team Organizer	Nov. 2022
Mentorship Program Volunteer	2021 – present

American Chemical Society (ACS)

Science Coach (Education Outreach Initiative)	2023 – 2024
5× Peer Reviewer of ACS Macromolecules	2022 – present

Brigham Young University (BYU) Chemical Engineering Graduate Student Council (GSC)

President and Cofounder	2018 – 2021
Organizer of Department Recruitment Poster Event	2019, 2020, 2021

Department BBQ Social Organizer 2018 – 2021
Department-Wide Survey Administrator on Graduate Student Financial Health Fall 2021
Social Media Accounts Manager Fall 2021

American University of Sharjah (AUS) IEEE Engineering in Medicine & Biology Society (EMBS) chapter
Chemical Engineering Research Coordinator 2016 – 2017
Biomedical Engineering Symposium Organizer & Poster Session Lead 2016, 2017

Outreach Activities

Lecture series for highschoolers at Bradenton Christian School (ACS Science Coach) 2023 – 2024
Highschoolers Programming and Scientific Computing Summer Workshop facilitator June 2023
Florida State Science and Engineering Fair (SSEF Florida) judge Apr. 2023
Josephine C. Locke Elementary School visiting scholar talk (APS Physicist To-Go) 2022
Frequent science/engineering fair judge at local elementary schools 2021 – present

Selected Presentations

[22] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Contrasting Reinforcement Mechanisms in Elastomeric Nanocomposites". AIChE Annual Meeting. American Institute of Chemical Engineers. San Diego, CA, 2024.

[21] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Polymer-Filler Competition-Driven Reinforcement Beyond the Payne Effect in Elastomeric Nanocomposites". APS March Meeting. American Physical Society. Minneapolis, MN, 2024.

[20] Harshad Bhapkar, Pierre Kawak, and David S. Simmons. "Exploring the Effects of Nanoparticle Loading, Dispersion and Structure on the Stress Response of Elastomeric Nanocomposites". APS March Meeting. American Physical Society. Minneapolis, MN, 2024.

[19] Pierre Kawak, David S. Simmons, and Douglas R. Tree. "Rational Sustainable Polymer Materials Design Using Multiscale Simulation and Theory". AIChE Annual Meeting. American Institute of Chemical Engineers. Orlando, FL, 2023.

[18] Pierre Kawak, Makayla Branham, William F. Drayer, and David S. Simmons. "Tuning Polymer Dynamics Via Sequence Control". AIChE Annual Meeting. American Institute of Chemical Engineers. Orlando, FL, 2023.

[17] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Elucidating the Molecular Origins of Reinforcement in Filled Elastomers Via Spatial- and Species-Resolved Stresses from Molecular Dynamics Simulations". AIChE Annual Meeting. American Institute of Chemical Engineers. Orlando, FL, 2023.

[16] Harshad Bhapkar, Pierre Kawak, and David S. Simmons. "Insights into the Dependence of Elastomeric Nanocomposite Mechanics on Nanoparticulate Properties". AIChE Annual Meeting. American Institute of Chemical Engineers. Orlando, FL, 2023.

[15] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Dissecting the Payne Effect: How Filler-Polymer Competition Reinforces Elastomeric Nanocomposites". IOP Polymer Physics Group Graduate Symposium. Institute of Physics. Virtual, 2023.

[14] Pierre Kawak. "Career Paths in Physics". Physics Colloquia Series. University of South Florida Department of Physics. Tampa, FL, 2023.

[13] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Exploring Mechanisms of Enhanced Dissipation in Nanoparticle-filled Rubber Using Molecular Dynamics". Annual Postdoctoral Research Symposium. University of South Florida. Tampa, FL, 2023.

[12] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Exploring mechanisms of enhanced dissipation in nanoparticle-filled rubber using molecular dynamics". APS March Meeting. American Physical Society. Las Vegas, NV, 2023.

[11] Douglas R. Tree and Pierre Kawak. "Free Energy Analysis of Crystal Nucleation of Semiflexible Polymers". APS March Meeting. American Physical Society. Las Vegas, NV, 2023.

[10] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Spatially resolving energy dissipation in molecular dynamics of polymer nanocomposites". APS March Meeting. American Physical Society. Las Vegas, NV, 2023.

[9] Pierre Kawak, Dakota S. Banks, and Douglas R. Tree. "Acute Sensitivity of Polymer Crystallization Phase Behavior to Intermolecular Interactions". AIChE Annual Meeting. American Institute of Chemical Engineers. Phoenix, AZ, 2022.

[8] Pierre Kawak. "Be the Black Sheep: Standing Out from the Crowded Field". oSTEM Conference. Out in STEM Incorporated. Boston, MA, 2022.

[7] Pierre Kawak, Dakota S. Banks, and Douglas R. Tree. "Free Energy Analysis of Polymer Crystal Nucleation Indicates Cooperative Crystallization and Nematic Alignment". APS March Meeting. American Physical Society. Chicago, IL, 2022.

[6] Pierre Kawak, Dakota S. Banks, and Douglas R. Tree. "Free Energy Surfaces for Homogeneous Nucleation in a Polymer Melt". AIChE Annual Meeting. American Institute of Chemical Engineers. Boston, MA, 2021.

[5] Pierre Kawak, Dakota S. Banks, and Douglas R. Tree. "GPU-accelerated Wang-Landau Simulation of Polymer Crystallization". APS March Meeting. American Physical Society. Virtual, 2021.

[4] Pierre Kawak, Andrew S. Gibson, Logan S. Brown, Beverly Delgado, Douglas R. Tree, and Dakota S. Banks. "Investigating Primary Nucleation in Polymer Melts using GPU-Accelerated Wang-Landau Simulations". AIChE Annual Meeting. American Institute of Chemical Engineers. Virtual, 2020.

[3] Pierre Kawak, Andrew S. Gibson, Logan S. Brown, Beverly Delgado, and Douglas R. Tree. "Wang-Landau Simulation of the Free Energy Surface of Crystallization in a Polymer Melt". APS March Meeting. American Physical Society. Virtual, 2020.

[2] Pierre Kawak, Vinod Paul, Paul Kawak, Rita Kassermally, Fatme Lahib, Rute F. Vitor, Mohammad Al-Sayah, and Ghaleb A. Husseini. "Doxorubicin-Encapsulated, Estrone-Appended Liposomes Triggered by Ultrasound for the Treatment of Breast Cancer". Graduate Students Research Conference. UAE Ministry of Education. Khalifa University, Abu Dhabi, UAE, 2017.

[1] Pierre Kawak, Christian C. Momah, Mohamed A. Elkhodiry, Shaima R. Suwaidi, Dina Gadalla, Fatehia M. Banamah, Rute F. Vitor and Hesham G. Moussa, Ana M. Martins and Mohammad Al-Sayah, and Ghaleb A. Husseini. "A Peptide-Targeted Nanodelivery System Triggered by Ultrasound for Anticancer Therapy". Life Sciences Grand Challenges Conference. Institute of Engineering and Electronics Engineering. Khalifa University, Abu Dhabi, UAE, 2016.

References

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Assistant Professor of Chemical Engineering; Brigham Young University *PhD Advisor*

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Professor of Chemical Engineering; American University of Sharjah *MS Advisor*

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