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 specific atomistic copolymer sequences
- Analyzing dynamics of automated quench simulations to calculate Tg

Molecular Origins of Polymer Nanocomposite Toughness (PNC) with David S. Simmons — 2022 – Present

Expertise: Nonequilibrium MD, Rouse Modes Analysis, Polymer Viscoelasticity, Stress Dissipation

- Developing equilibrium & non-eq. LAMMPS MD simulators to study rheology of filled rubber (PNCs)
- Analyzing nonlinear rheological response via local & global metrics to identify origin of toughness

Polymer Crystal Simulation with Douglas R. Tree — 2017 – 2022

Expertise: Free Energy Analysis, Molecular Simulations, Morphology Analysis, Nucleation Theory, High Performance Computing

- Developed and maintained 2 molecular simulators to study coarse-grained polymers
- Evaluated 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

- Synthesized, validated and tested novel nanoparticle carrier for treatment of breast cancer cells
- Developed lab protocols that remain in contemporary use

Publications

[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

[3] Pierre Kawak, Harshad Bhapkar, and David S. Simmons. "Central role of filler-polymer competition in nonlinear reinforcement of elastomeric nanocomposites" (submitted).

[2] Douglas R. Tree and Pierre Kawak. "The Search for a Molecular-Level Understanding of Nucleation in Polymer Crystallization" (in preparation).

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

Selected Presentations

[18] 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.

[17] 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.

[16] 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.

[15] 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.

[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.

Honors and Awards

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

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 *American University of Sharjah*	Corrosion Lab ChemE Lab I Graduate Desalination Wastewater Treatment	2016 – 2017 (2x) 2015 – 2016 (2x) Spring 2015 Spring 2015
Undergraduate Teaching Assistant *American University of Sharjah*	Mass Transfer Kinetics	2014 – 2015 (3x) Fall 2014

	Thermodynamics	Spring 2014
Private Tutor	Maths, Engineering, Business, etc.	2008 – now

Community and Service

National Postdoctoral Association (NPA) IMPACT Fellowship 2023 – 2024

American Physical Society (APS)

DPOLY March Meeting Focus Session Organizer "Polymer Structure and Dynamics across Multiple Length and Timescales" Mar 2024
Physicists To-Go Public Engagement Program Participant 2022 – present
Career Mentoring Fellow 2022 – 2023
Early Career Member-at-Large of DPOLY Executive Committee 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 2022 – present
Cofounder of Self-Development Seminar series 2022 – present
Organizer of Virtual Polymer Physics Symposium Aug 2023

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.

Mentorship Program Volunteer 2021 – present
Annual Conference Volunteer and Organizer Nov. 2022
Annual Conference Merchandise Team Organizer Nov. 2022
Scholarship Review Volunteer 2022 – present
Scholarship Coordinator 2023 – present

5× Peer Reviewer of **American Chemical Society 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

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

Programming and Scientific Computing Summer Workshop facilitator for highschoolers	June 2022
Florida State Science and Engineering Fair (SSEF Florida) judge	Apr. 2022
Josephine C. Locke Elementary School visiting scholar talk	2022
Frequent judge at local elementary schools	2021 – present

References

David S. Simmons +1 (813) 974-4988 dssimmons@usf.edu
Associate Professor of Chemical Engineering; University of South Florida *Postdoc Advisor*

Douglas R. Tree +1 (801) 422-5162 tree.doug@byu.edu
Assistant Professor of Chemical Engineering; Brigham Young University *PhD Advisor*

Ghaleb A. Husseini +971 (6) 515-2970 ghusseini@aus.edu
Professor of Chemical Engineering; American University of Sharjah *MS Advisor*

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