Pierre Kawak, Ph.D.

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Professional Summary

Computational polymer scientist with 11+ years advancing materials and drug delivery through high-impact modeling, simulation, and cross-functional collaboration — delivering scalable tools, 50+ TB HPC workflows, and award-winning insights across academia and industry. Passionate about accelerating discovery at the intersection of polymers, computation, and applied research.

Technical Skills

- **Programming & Automation:** Python, C++, CUDA, MATLAB, Bash, R, Julia
- **Simulation & Modeling:** LAMMPS, GROMACS, Gaussian, AMBER, OPLS, Molecular Dynamics, Monte Carlo, Free Energy Calculations
- **Analysis & Visualization:** VMD, OVITO, NumPy, Pandas, scikit-learn, Matplotlib
- **High-Performance Computing:** Slurm, MPI, Parallelism, Automation, 50TB+ Data
- **Experimental Techniques:** Drug Encapsulation, DLS, NMR, Liposomal Formulations
- **Communication & Leadership:** Scientific Writing, Mentorship, Advocacy, 27+ Conference Talks, 5 Publications

Research Experience

Postdoctoral Researcher, University of South Florida *2022 – Present*
Advisor: Prof. David Simmons

- Simulated polymer deformation to inform composite design strategies at the nanoscale.
- Enhanced copolymer glass transition temperature via sequence-specific simulations; improving thermal stability without altering feedstock or processing.
- Developed rheology tools and extended internal analysis codebase; accelerating workflows and boosting team efficiency.
- Streamlined HPC pipelines processing 50+ TB datasets; cut analysis time by 90% and earned NSF ACCESS grant.
- Mentored 11 researchers in simulations, Git, and HPC; named APS Mentoring Fellow.
- Delivered 17 conference talks; earned awards at GRC (2024) and USF Symp. (2023).

Ph.D. Researcher, Brigham Young University *2017 – 2022*
Advisor: Prof. Douglas Tree

- Developed two GPU-accelerated Monte Carlo simulation codes in C++/CUDA; accelerated crystallization research by 100×.

- Generated 3D free energy landscapes & phase diagrams using novel order parameters.
- Analyzed large 3D datasets with OVITO to uncover kinetic and structural transitions.
- Mentored 4 undergraduates; co-authored 2 papers and 6 conference abstracts.
- Won APS Distinguished Student Award and BYU Research Presentation Award.
- Contributed key data to a successful $500K NSF CAREER proposal.

Graduate Researcher, American University of Sharjah *2015 – 2017*
Advisor: Prof. Ghaleb Husseini

- Synthesized estrone-functionalized drug nanocarriers; enhanced release control for chemotherapy applications.
- Validated drug stability & kinetics with DLS/NMR; optimized ultrasonic parameters.
- Standardized lab protocols; boosted reproducibility and cross-lab collaboration.
- Presented at 3 conferences; awarded Best Talk at AUS Biomedical Symposium.

Leadership & Community Engagement

- **President**, Early Career Researchers in Polymer Physics (2022–Present): Led 550+ member global network, organized 150+ attendee virtual symposium.
- **Founder & President**, USF Postdoctoral Scholar Association (2023–Present): Launched NPA-funded ELEVATE Talk Series and DEI programs for 200+ postdocs.
- **Founder & President**, BYU Chem. Eng. Graduate Council (2019–2022): Shaped department policies and spearheaded outreach and recruitment.

Selected Peer-Reviewed Publications

[4] **P. Kawak**, H. Bhapkar, and D. Simmons. "On the origin of heating-induced stiffening and enthalpic reinforcement in elastomeric nanocomposites". In: (2025). arXiv: 2501.06971.

[3] **P. Kawak**, H. Bhapkar, and D. Simmons. "Central role of filler-polymer interplay in nonlinear reinforcement of elastomeric nanocomposites". In: *Macromolecules* 57 (2024). DOI: 10.1021/acs.macromol.4c00489.

[2] **P. Kawak**, C. Akiki, and D. Tree. "Effect of local chain stiffness on oligomer crystallization from a melt". In: *Phys. Rev. Mater.* 8 (2024). DOI: 10.1103/PhysRevMaterials.8.075606.

[1] **P. Kawak**, D. Banks, and D. Tree. "Semiflexible oligomers crystallize via a cooperative phase transition". In: *J. Chem. Phys.* 155 (2021). DOI: 10.1063/5.0067788.

Education

Ph.D. in Chemical Engineering, Brigham Young University *2022*
M.S. in Chemical Engineering, American University of Sharjah *2017*
B.S. in Chemical Engineering (Econ. Minor), American University of Sharjah *2015*

Full list of publications and presentations available at linktr.ee/pkawak