

Pierre Kawak, Ph.D.

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- 7+ years of computational materials expertise in rubber mechanics, polymer reinforcement, free energy analysis, high-performance molecular modeling, nonlinear rheology, and material degradation modeling.
- Authored 5 peer-reviewed articles on filled rubber mechanics, polymer dynamics, and material performance optimization.
- Developed & optimized large-scale molecular simulations (LAMMPS, GROMACS, AMBER) to analyze stress-strain behavior, failure, & reinforcement mechanisms.
- Awarded NSF Discover ACCESS Compute Grant (2023) for large-scale simulation studies on rubber durability & reinforcement.
- Presented at 27+ conferences (APS, ACS, AIChE, GRC, etc.) to industry, government, and academic audiences.
- Proficient in Python, C++, CUDA, bash, HPC, Slurm, Open MPI, MATLAB, R, and advanced molecular visualization tools (VMD, OVITO).

Research Experience

Postdoctoral Researcher	University of South Florida (USF)	2022 – Present
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- Developed & implemented large-scale molecular dynamics (MD) simulations in LAMMPS, GROMACS, AMBER, and OPLS to analyze rubber deformation & relaxation.
- Created novel nonlinear rheology analysis techniques, identifying nanoscale reinforcement mechanisms that improve rubber toughness and energy dissipation.
- Optimized copolymer thermal stability by simulating coarse-grained & atomistic sequences, identifying novel sequences with enhanced glass transition temperatures T_g without changing feedstock or processing conditions.
- Leveraged HPC & parallel computing to perform multi-terabyte MD simulations, securing an NSF Discover ACCESS Compute Resource Grant (2023).
- Developed Python, C++, bash, Slurm, Open MPI, & R automation tools for molecular modeling of polymer dynamics & mechanics, accelerating team-wide computational workflows, streamlining multi-terabyte data analysis, & improving research efficiency.
- Mentored & trained 11 researchers in HPC, version control, & molecular simulations, boosting collaboration, productivity, & technical skill development & earning the APS Career Mentor Fellowship (2023).
- Presented findings at 17+ institutional, industrial, & academic conferences, highlighting advancements in rubber & copolymer technology, as well as polymer theory, & earning the Outstanding Poster Award at the Gordon Research Conference (2024) & the USF Annual Postdoctoral Research Symposium Best Poster Award (2023).

Doctoral Researcher	Brigham Young University	2017 – 2022
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- Developed, optimized, & deployed GPU-accelerated Monte Carlo simulations in C/CUDA, achieving 100× speedup in property computes, enabling experimental comparison.
- Automated high-throughput simulations using Python, C++, bash, MATLAB, & R, sweeping multi-dimensional parameters & accelerating studies of polymer crystals.

- Constructed the first-ever 3D free energy landscapes for polymer crystallization, differentiating order-formation pathways inaccessible to classical simulations.
- Developed advanced phase diagrams & applied order parameters for crystalline & orientational order, quantifying phase transitions in complex molecular landscapes.
- Visualized & analyzed large datasets of 3D molecular configurations using VMD & OVITO, extracting key structural & kinetic insights.
- Wrote 2 journal articles with 2 mentored undergraduates, supporting their careers.
- Secured research awards, e.g., APS Forum on Intl. Physics Distinguished Student Award (2022) & BYU Grad. Student Society Professional Presentation Award (2021).
- Presented at 6 hybrid conferences, communicating findings through pandemic.
- Directly contributed to an NSF CAREER Award (\$500,000) for continued crystallization research by producing critical preliminary findings.

Masters Research American University of Sharjah 2015 – 2017

- Developed & characterized polymer-based nanoparticles, applying NMR and DLS assays to validate mechanical stability and crosslinking efficiency.
- Optimized self-assembling polymer formulations for controlled molecular interactions and phase behavior.
- Standardized lab protocols to improve reproducibility, collaboration, & data integrity, increasing research efficiency across teams.
- Published findings in a peer-reviewed journal and presented at three conferences, winning the AUS Biomedical Engineering Symposium Best Talk Award (2016).

Leadership & Community Engagement

President Early Career Researchers in Polymer Physics 2022 – Present

- Led a 550-member global Slack community, organizing networking, technical, self-development, & conference prep events, improving belonging of polymer researchers.
- Organized the 2023 Virtual Polymer Physics Symposium, a 2-day intl. event with 150+ attendees, 4 technical sessions, a DEI discussion, & a diverse career panel.

President and Founder USF Postdoctoral Scholar Association 2023 – Present

- Served 200+ postdocs through career programming, networking events, & advocacy, e.g., ELEVATE Talk Series, funded by NPA IMPACT Fellowship (2023, 6% acc. rate).

President and Founder BYU Chem. Eng. Graduate Student Council 2019 – 2022

- Organized dept. recruitment, social & outreach events, social content, & financial well-being initiatives, e.g., Recruitment Poster Event (2019–2021) & BBQ Socials (2018–2021).
- Administered a financial health survey to assess graduate student well-being, influencing department policy discussions (2021).

Education

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