

# Pierre Kawak, Ph.D.

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- 7 years of computational expertise in molecular modeling, material characterization, free energy analysis, computational chemistry, crystallization, & material mechanics.
- 4 years of experimental expertise in breast cancer treatment, liposomal formulations, surface functionalization, active targeting, drug delivery kinetics, & ultrasonification.
- Authored 5 peer-reviewed articles, contributing to advancements in copolymer theory, polymer dynamics modeling, filled rubber mechanics, & cancer drug delivery.
- Presented at 27 institutional, national, & intl. conferences (e.g., APS, ACS, AIChE, USF, AUS, GRC, IoP, etc.) to diverse audiences from industry, govt., & academia.
- Passionate about using computational methods to solve challenges in pharma & biotech.

## Professional Experience

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<b>Postdoctoral Researcher</b>	<b>University of South Florida (USF)</b>	<b>2022 – Present</b>
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- Developed & implemented large-scale molecular dynamics simulations using LAMMPS, GROMACS, Gaussian, AMBER, & OPLS, achieving high-throughput insights into nanoscale deformation, relaxation, & stress distribution in polymer composites.
- Created novel molecular simulation analysis techniques for nonlinear rheology, identifying nanoscale toughening factors that favor enhanced rubber performance.
- 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 high-performance & parallelism to conduct multi-terabyte simulations on supercomputers, 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).

<b>President</b>	<b>Early Career Researchers in Polymer Physics</b>	<b>2022 – Present</b>
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- 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.

<b>President and Founder</b>	<b>USF Postdoctoral Scholar Association</b>	<b>2023 – Present</b>
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- Served 200+ postdocs through career programming, networking events, & advocacy, e.g., ELEVATE Talk Series, funded by NPA IMPACT Fellowship (2023, 6% acc. rate).

**Doctoral Researcher                      Brigham Young University                      2017 – 2022**

- 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 conferences & directly contributed to an NSF CAREER Award (\$500,000) for continued crystallization research by producing critical preliminary findings.

**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).

**Masters Researcher                      American University of Sharjah                      2015 – 2017**

- Developed ultrasound-sensitive drug delivery systems to improve chemotherapy efficiency, winning the AUS Biomedical Engineering Symposium Best Talk Award (2016).
- Designed & synthesized tumor-targeting liposomal drug carriers by functionalizing phospholipids with estrone ligands, improving breast cancer drug delivery precision.
- Formulated & optimized self-assembling chemotherapy nanoparticles using the dry film method, enhancing drug stability & controlled release kinetics.
- Validated encapsulation efficiency & nanoparticle integrity through NMR & DLS assays, ensuring high drug-loading capacity & structural robustness.
- Characterized & optimized ultrasound-triggered drug release kinetics, determining the ideal US frequency & intensity for future clinical applications.
- Standardized lab protocols to improve reproducibility, collaboration, & data integrity, increasing research efficiency across teams.
- Published findings in a peer-reviewed journal & presented at 3 conferences, disseminating contributions to biomedical engineering & drug delivery research.

## **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