

# 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 computation to solve challenges in materials & pharma.

## Research Experience

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**Postdoctoral Researcher**                      **University of South Florida (USF)**                      **2022 – Present**

- 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.
- Optimized HPC workflows to process 50TB+ datasets, accelerating computational studies by 90% & securing an NSF Discover ACCESS Compute Resource Grant (2023).
- Mentored & trained 11 researchers in HPC, version control, & molecular simulations, boosting collaboration, productivity, & earning APS Career Mentor Fellowship (2023).
- Presented findings at 17 industrial & academic conferences, highlighting advancements in rubber & copolymer technology, as well as polymer theory, & earning poster awards at the Gordon Research Conference (2024) & USF Postdoc Symposium (2023).

**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, reducing parameter-sweep runtimes & enabling large-scale polymer crystal studies.
- 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.

- Mentored 4 undergraduate researchers, co-authoring 2 journal articles & 6 conference abstracts, thereby supporting their transition to graduate-level careers.
- Secured research awards, e.g., APS Forum on Intl. Physics Distinguished Student Award (2022) & BYU Grad. Student Society Professional Presentation Award (2021).
- Contributed critical preliminary findings that supported the successful NSF CAREER Award (\$500,000) proposal for continued crystallization research.

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

- Designed ultrasound-sensitive drug delivery systems to improve chemotherapy efficiency, winning the AUS Biomedical Engineering Symposium Best Talk Award (2016).
- Engineered estrone-functionalized phospholipid liposomal drug carriers, enhancing 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.
- Quantified ultrasound-triggered drug release across frequency & intensity gradients, identifying optimal acoustic parameters for clinical performance & stability.
- 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.

## **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

Comprehensive and updated list of publications and presentations available online at [linktr.ee/pkawak](https://linktr.ee/pkawak)