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.

Research Experience

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.

- Leveraged HPC & parallel computing to perform multi-terabyte 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, & earning 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
- Developed, optimized, & deployed GPU-accelerated Monte Carlo simulations in C/CUDA, achieving $100\times$ 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.

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.

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