Cody Bezik, PhD

4402260791
ctbezik@gmail.com
http://codybezik.com

Computational chemical engineer with extensive experience in performing and analyzing molecular simulations and programming advanced free energy sampling algorithms. Technical expertise in writing Python and C/C++-based analysis tools in a Linux environment and utilizing distributed computing platforms. Working knowledge in the application of machine learning algorithms, especially in chemical engineering and materials science. Strong verbal and written communication skills, with an extensive presentation and publication record and an established history of collaboration with experimental researchers.

Education

2015–2021 **PhD, Molecular Engineering**, *University of Chicago*, Chicago, IL

advisor: Professor Juan de Pablo

gpa: 3.97/4.0

dissertation title: Manipulating Surfaces and Architectures in Block Copolymer Self-Assembly for Nanolithography and Thermoplastic Elastomers

2011–2015 **MS,Chemical Engineering**, *Case Western Reserve University*, Cleveland, OH

advisor: Professor Ica Manas-Zloczower, Professor Donald Feke

gpa: 3.84/4.0

thesis title: Poly (High Internal Phase Emulsion) Foams and Fibers: Structure-Property Relationships

2011–2015 **BS, Chemical Engineering**, *Case Western Reserve University*, Cleveland, OH

gpa: 3.80/4.0

honors: Magna Cum Laude

Experience

2021-present **Postdoctoral Researcher**, *Sandia National Laboratories*, Albuquerque, NM

• Advanced an understanding of the molecular structure/bulk property relationships in crosslinked polymers via a coarse-grained Lennard-Jones model, targeting tailored glass transition temperature, mechanical properties, and self-healability. • Coordinated with experimentalists at Sandia, pursuing molecular-level insight into experimentally observed phenomenological properties in their prepared blend compositions. • Performed molecular dynamics simulations of ion species in water and in the presence of a polymer membrane, pursuing systems relevant to grid-scale alkaline batteries for green energy storage. • Oversaw an undergraduate summer student, designing an eight-week research project on self-healing polymers, with the goal of providing a hands-on introduction to computational molecular simulation.

2015-2021 **Graduate Student Researcher**, *University of Chicago*, Chicago, IL

• Utilized coarse-grained dynamics simulations to study fluctuation-stabilized block copolymer networks for use as thermoplastic elastomers. • Executed computational research focused on the directed self-assembly of block copolymers, especially in geometries and confinements relevant to semiconductor device fabrication, with close integration with experimental partners. • Collaborated on developing a coarse-grained model implemented in a Monte Carlo simulator to study the assembly process in cylindrical geometries (the hole-shrink process) and lamellae in thin film. • Implemented advanced free energy calculations to understand these systems further. • Contributed to developing the Software Suite for Advanced General Ensemble Simulations (SSAGES), an open-source software package written in C++ designed to provide easy access to free energy calculations for research purposes.

fall 2016 **Visiting Scholar**, *KU Leuven*, Leuven, Belgium
• Designed simulations of block copolymer self-assembly to test hypotheses about experimentally observed assembly behavior in close coordination with industry partners at Mentor Graphics (Siemens EDA) and experimental researchers at KU Leuven and imec.

2012–2015 **Undergraduate Student Researcher**, *Case Western Reserve University*, Cleveland, OH
• Uncovered structure-property relationships in poly-(high internal phase emulsion) foam based systems. • Analyzed the effect that the composition of the emulsion precursor had on resulting foam properties. • Developed a patented method, in collaboration with industrial partners at Procter & Gamble, for the production of poly-(HIPE) fibers.

Technical Skills

Programming Languages	C/C++, Python (NumPy, SciPy, matplotlib, pandas)
Molecular Simulation	Molecular Dynamics (LAMMPS, Gromacs, HOOMD-blue), Monte Carlo
Visualization Software	VMD, Ovito
Operating Systems	Windows, Linux (Git, Slurm)

Select Publications

in preparation **Bezik, C. T.**, & Frischknecht, A.L. (2022). *In-silico* Glass Transition Behavior of Crosslinked Epoxy/Amine Resins: Influence of Blend Composition, Network Architecture, and Hydrogen Bonding.

published **Bezik, C. T.**, Mysona, J. A., Schneider, L., Ramírez-Hernández, A., Müller, M., & de Pablo, J. J. (2022). Is the "Bricks-and-Mortar" Mesophase Bicontinuous? Dynamic Simulations of Miktoarm Block Copolymer/Homopolymer Blends. Macromolecules. https://doi.org/10.1021/acs.macromol.1c01763

Bezik, C. T., & de Pablo, J. J. (2020). Formation, Stability, and Annihilation of the Stitched Morphology in Block Copolymer Thin Films. Macromolecules, 53(23), 10446–10456. https://doi.org/10.1021/acs.macromol.0c01777

Dolejsi, M., Moni, P., **Bezik, C. T.**, Zhou, C., de Pablo, J. J., Gleason, K. K., & Nealey, P. F. (2019). Ultrathin initiated chemical vapor deposition polymer interfacial energy control for directed self-assembly hole-shrink applications. Journal of Vacuum Science & Technology B, 37(6), 061804. https://doi.org/10.1116/1.5121541

Doise, J., **Bezik, C.**, Hori, M., de Pablo, J., & Gronheid, R. (2019). Influence of Homopolymer Addition in Templated Assembly of Cylindrical Block Copolymers. ACS Nano, 13(4), 4073-4082. https://doi.org/10.1021/acsnano.8b08382

Bezik, C. T., Garner, G. P., & de Pablo, J. J. (2018). Mechanisms of Directed Self-Assembly in Cylindrical Hole Confinements. Macromolecules, 51(7), 2418–2427. https://doi.org/10.1021/acs.macromol.7b02639

Sidky, H., Colón, Y. J., Helfferich, J., Sikora, B. J., **Bezik, C.**, Chu, W., ... de Pablo, J. J. (2018). SSAGES: Software Suite for Advanced General Ensemble Simulations. The Journal of Chemical Physics, 148(4), 044104. https://doi.org/10.1063/1.5008853

R. Foudazi, **C. Bezik**, D.L. Feke, I. Manas-Zloczower, S. R. Merrigan, & S. J. Rowan, 2017, "Method for the Production of High Internal Phase Emulsion Foams", US Patent 2017/9574058B2