

Cody Bezik

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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 Appointee**, *Sandia National Laboratories*, Albuquerque, NM

- Simulated highly-branched, multi-component, glassy 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.
- Co-advised an undergraduate summer student from June 2022-August 2022, designing an eight-week research project on self-healing polymers, with the goal of providing a hands-on introduction to computational molecular simulation.

advisor: Dr. Amalie Frischknecht

2015-2021 **Graduate Research Assistant**, *University of Chicago*, Chicago, IL

- Utilized coarse-grained dynamics simulations to study fluctuation-stabilized block copolymer networks for use as thermoplastic elastomers.
- Performed 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 collaborators.
- Collaborated on development of a coarse-grained model implemented in a Monte Carlo simulator to study the assembly process in cylindrical geometries (the hole-shrink process) as well as for lamellae in thin film.
- Implemented advanced free energy calculations to further understand these systems.
- Collaborated on the development of 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.

2017-2018 **Teaching Assistant and Co-Instructor**, *University of Chicago*, Chicago, IL

- Served as a teaching assistant for an undergraduate and graduate course, both titled “Thermodynamics and Statistical Mechanics” in 2017, and a co-instructor for the 2018 undergraduate course of the same name.
- Held weekly review sessions and office hours.
- Gave lectures while the instructors are out of town.
- Wrote and graded assignments.
- Proctored and graded exams.

- fall 2016 **Visiting Scholar**, *KU Leuven*, Leuven, Belgium
- Worked closely with experimental researchers at KU Leuven and imec, as well as industry partners at Mentor Graphics, to design simulations of block copolymer self assembly to test hypotheses about experimentally observed assembly behavior.
- 2012–2015 **Research Assistant**, *Case Western Reserve University*, Cleveland, OH
- Experimentally studied structure-property relationships in poly-(high internal phase emulsion) foam based systems. • Analyzed the effect that composition of the emulsion precursor had on resulting foam properties. • Collaborated on developing a patented method for production of poly-(HIPE) fibers with other researchers at CWRU and industrial partners at Procter & Gamble.
- fall 2014 **Teaching Assistant**, *Case Western Reserve University*, Cleveland, OH
- Served as a teaching assistant for an undergraduate laboratory course, titled “ Introduction to Chemical Engineering at Case”. • Supervised laboratory activities. • Graded assignments.
- spring 2012 **Research Assistant**, *Case Western Reserve University*, Cleveland, OH
- Analyzed the thermal behavior of methylcellulose in aqueous solution, particularly focusing on quantifying the growth rate of solidifying material around a heated wire using a high-speed camera.

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.
- in review Foster, J. C., Yoon, A., Lyons, K., Martinez, E.J., Leguizamon, S.C., **Bezik, C. T.**, Frischknecht, A.L., & Redline, E.R. (2022). Unexpected Thermomechanical Behavior of Off-Stoichiometry Epoxy/Amine Materials.
- 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>
- Zhou, C., Kurosawa, T., Dazai, T., Doise, J., Ren, J., **Bezik, C.**, ... Nealey, P. F. (2018). Studying the effects of chemistry and geometry on DSA hole-shrink process in three dimensions. In E. M. Panning & M. I. Sanchez (Eds.), *Emerging Patterning Technologies 2018* (p. 19). SPIE. <https://doi.org/10.1117/12.2297461>
- 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