

Benjamin R. Nelson

PhD student, University of Colorado

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Education

University of Colorado Boulder – Department of Chemical and Biological Engineering

2021–Present PhD student, Chemical Engineering
Co-advisors: Dr. Chris Bowman, Dr. Kristi Anseth
Thesis: “1,2-Dithiolanes as photodynamic crosslinkers in polymer networks”

Luther College

2017–21 Bachelor of Arts, Summa Cum Laude, Chemistry
Minors in Physics and Mathematics
Research and Academic Advisor: Dr. Molly Wilker
Thesis: “Influence of Shape on Optical and Heterostructure Deposition Properties of CdSe Semiconductor Nanocrystals”

Research Experience

2021-Present Research Assistant, Anseth and Bowman Research Groups, CU Boulder
Applying 1,2-dithiolanes as photodynamic polymerizable moieties in a wide variety of crosslinked networks spanning hydrogels to recyclable thermosets, as well as probing the mechanism of photoinduced dithiolane homopolymerization.

2024-25 DOE Office of Science Graduate Student Research Fellow, Sandia National Laboratories, Albuquerque
Research stay at Sandia National Laboratories as part of thesis research to investigate the dithiolane photopolymerization mechanism using photo NMR.

2021 Research Assistant, Bio-Techne, Minneapolis
Investigated the use of alginate hydrogels in bulk and microgel form for the start of a tissue culture program.

2021 Visiting Scholar, Montanuniversität Leoben, Austria
Developed elastomeric networks using new orthogonal polymerization chemistries which allowed the material properties to be modified post-polymerization with irradiation by a different wavelength of light.

2018–21 Research Assistant, Wilker Research Group, Luther College
Investigated the impact of CdSe Nanocrystal shape on optical, vibrational, and heterostructure deposition properties.

2020 Volunteer Research Assistant, Bio-Techne, Minneapolis
Completed two biosensor projects for the development of a peptide-capped silver nanoparticle assay for the detection of trypsin and the development of novel detection reagents for use in high sensitivity ELISA.

2019 Research Assistant, NSF REU, Bowman & RPM Research Groups, CU Boulder
Synthesized a novel hybrid thiol-ene/acrylate network to improve the uniformity of liquid crystal elastomers.

Selected Honors and Awards

2025 Outstanding Oral Abstract, Excellence in Graduate Polymer Research Symposium, Spring 2025 ACS Meeting

2024 Office of Science Graduate Student Research (SCGSR) Fellowship Awardee, U.S. Department of Energy

2023 University of Colorado Chemical Engineering Masters Bypass Outstanding Poster

2023 CSU Polymer Day 1st Place Outstanding Poster

2020–21	Adrian M. Docken Scholarship for Chemistry, Luther College
2020–21	Herbert J. Rebassoo Scholarship for Mathematics and Science, Luther College
2020–21	Emerson Family Scholarship for Mathematics, Luther College
2019–21	Dr. Herman Ellingson Scholarship for Mathematics and Physical Sciences, Luther College
2019–20	Stephen W. & Kari M. Noltner Scholarship for Physical Chemistry, Luther College
2019–20	R.J. McElroy Trust Research Fund Grant Recipient, Iowa Colleges Foundation
2018–21	Academic All-Conference Football, American Rivers Conference
2017–21	Fall and Spring Semester Dean's List, Luther College

Teaching Activities

2025	Co-instructor, CHEN 4330/BIEN 4830: Kinetics and Reaction Engineering/Biokinetics, 2025 Spring Semester Dr. Chris Bowman, Primary Instructor
2024	Advanced Teaching Assistant, CHEN 4450/5450: Polymer Chemistry, 2024 Spring Semester Dr. Chris Bowman, Primary Instructor Developed and instructed the lab component of the class, wrote homework and quiz questions, taught three lectures.
2022	Teaching Assistant, CHEN 3200: Fluids, 2022 Spring Semester Dr. Dan Schwartz, Primary Instructor

Publications

Google Scholar [\[link\]](#)

Peer reviewed papers

*Indicates equal contribution

11. "Digital light processing of photoresponsive and programmable hydrogels"
AP Dhand, BE Kirkpatrick, M Garay-Sarmiento, **BR Nelson**, CE Miksch, B Meurer-Zeman, HM Zlotnick, A Mandal, JS Lee, JT Cione, CN Bowman, KS Anseth, JA Burdick, *Science Advances*, 11, 32, eadw9262, **2025**
10. "Chalcones as Wavelength-Selective Cross-Linkers: Multimaterial Additive Manufacturing of Macro-and Microscopic Soft Active Devices"
SM Müller, **BR Nelson**, R Höller, C Waly, A Jelinek, BE Kirkpatrick, SP Keyser, C Naderer, D Sivun, J Jacak, KS Anseth, CN Bowman, S Schlögl, T Griesser, *Chemistry of Materials*, 37, 8, 2699–2708, **2025**
9. "In vivo photothermal reconfiguration of liquid crystalline elastomer nanocomposites"
NP Skillin, BE Kirkpatrick, NE Friend, AR Perry, JM McCracken, MC Escobar, **BR Nelson**, NL Day, PS Hume, TK Rajab, KS Anseth, TJ White, *Cell Biomaterials*, 100022, **2025**
8. "Holographic Photopolymers via Two-Stage Orthogonal Thiol-Click Chemistries Leveraging Kinetic Selectivity"
JF Rynk, Y Hu, M Podgorski, **BR Nelson**, AN Sias, RR McLeod, CN Bowman, *ACS Applied Polymer Materials*, 7 (7), 4340-4347, **2025**
7. "Linear and Network-Forming Acetal Polymerization of Multifunctional Alcohols with Dichloromethane for Degradable and Recyclable Materials"
JT Kamps, BE Kirkpatrick, SP Keyser, CE Miksch, **BR Nelson**, JF Rynk, BD Fairbanks, KS Anseth, CN Bowman, *Macromolecules*, 58 (3) 1578-1584, **2025**
6. "Multifunctional dithiolane monomers for multi-scale, recyclable light-driven additive manufacturing"
BR Nelson, JT Cione, BE Kirkpatrick, KM Kreienbrink, AP Dhand, JA Burdick, CW Shields IV, KS Anseth, CN Bowman, *Polymer Chemistry*, 16, 2108-2116, **2025**

5. "Photodegradable polyacrylamide tanglemer enable spatiotemporal control over chain lengthening in high-strength and low-hysteresis hydrogels"
JS Lee*, BE Kirkpatrick*, AP Dhand, LP Hibbard, **BR Nelson**, NP Skillin, MC Johnson, D Batan, BD Fairbanks, TJ White, CN Bowman, JA Burdick, KS Anseth,
4. "Photochemical Control of Network Topology in PEG Hydrogels", *Journal of Materials Chemistry B*, 13 (3), 894-903, **2025**
BE Kirkpatrick, GK Hach, **BR Nelson**, NP Skillin, JS Lee, LP Hibbard, AP Dhand, HS Grotheer, CE Miksch, V Salazar, TS Hebner, SP Keyser, JT Kamps, J Sinha, LJ Macdougall, BD Fairbanks, JA Burdick, TJ White, CN Bowman, KS Anseth, *Advanced Materials*, 2409603, **2024**
3. "Stiffness anisotropy coordinates supracellular contractility driving long-range myotube-ECM alignment"
NP Skillin, BE Kirkpatrick, KM Herbert, **BR Nelson**, GK Hach, KA Gunay, RM Khan, FW DelRio, TJ White, KS Anseth, *Science Advances* 10 (22), eadn0235, **2024**
2. "Facile Physicochemical Reprogramming of PEG- Dithiolane Microgels"
BR Nelson, BE Kirkpatrick, NP Skillin, N Di Caprio, JS Lee, LP Hibbard, GK Hach, A Khang, TJ White, JA Burdick, CN Bowman, KS Anseth, *Advanced Healthcare Materials*, 13 (25), 2302925, **2023**.
1. "Photoinduced Dithiolane Crosslinking for Multiresponsive Dynamic Hydrogels"
BR Nelson*, BE Kirkpatrick*, CE Miksch, MD Davidson, NP Skillin, GK Hach, A Khang, SN Hummel, BD Fairbanks, JA Burdick, CN Bowman, KS Anseth, *Advanced Materials*, 36 (43), 2211209, **2023**

Undergraduate Thesis

1. "Influence of Shape on Optical and Heterostructure Deposition Properties of CdSe Semiconductor Nanocrystals"
BR Nelson, Luther College, 2021

Peer review activity

- Independent
ACS Macro letters
- Assisting Dr. Kristi Anseth
Advanced Materials, Angewandte Chemie, Biomacromolecules, Journal of the American Chemical Society
- Assisting Dr. Christopher Bowman
Advanced Materials, Advanced Functional Materials

Presentations

Academic Talks

7. "Mechanistic insights on the photopolymerization of 1,2-dithiolanes utilizing photo NMR"
BR Nelson, *Photopolymerization Fundamentals 2025*
6. "Multifunctional Dithiolane Monomers for Dynamic and Recyclable Networks"
BR Nelson, JT Cione, BE Kirkpatrick, KM Kreienbrink, AP Dhand, JA Burdick, CW Shields IV, KS Anseth, CN Bowman, *Dynamic Polymer Networks 2025*
5. "Multifunctional recyclable monomers from 1,2-dithiolanes"
BR Nelson, JT Cione, BE Kirkpatrick, KS Anseth, CN Bowman, *ACS Spring 2025*
BR Nelson awarded the Outstanding Oral Abstract in the Excellence in Graduate Polymer Research Symposium
4. "Anisotropic microgel production through photomediated disulfide exchange"
BR Nelson, BE Kirkpatrick, NP Skillin, N Di Caprio, JS Lee, LP Hibbard, GK Hach, A Khang, TJ White, JA Burdick, CN Bowman, KS Anseth, *ACS Fall 2024*

3. "Photocrosslinking Enabled by 1,2-dithiolanes for Dynamic and Responsive Materials"
BR Nelson, BE Kirkpatrick, M Trujillo-Lemon, JT Cione, KS Anseth, CN Bowman, *2024 European Symposium on Photopolymer Science*
2. "Dithiolane-Based Dynamic Hydrogels for Photoinduced Crosslinking, Exchange, and Depolymerization"
BR Nelson, BE Kirkpatrick, CE Miksch, MD Davidson, NP Skillin, GK Hach, BD Fairbanks, JA Burdick, CN Bowman, KS Anseth, *2023 Society for Biomaterials Annual Meeting*
1. "Novel Streptavidin Conjugated Dendrimers for Use in High Sensitivity ELISA"
BR Nelson, *2020 Undergraduate Research Symposium in the Physical Sciences, Mathematics and Computer Science, Midstates Consortium*

Posters

*Indicates poster presented by undergraduate mentee

(co-authored posters presented by graduate students or postdocs are not included)

- 12.* "Initiator Free Allyl Sulfide Covalent Adaptable Networks"
JT Cione, **BR Nelson**, CN Bowman, *Photopolymerization Fundamentals 2025*
- 11.* Photopolymerizable Biobased Dithiolane Adhesives for Optical Applications
A Sakamoto, **BR Nelson**, CN Bowman, *Photopolymerization Fundamentals 2025*
10. "Anisotropic shape remolding of dithiolane crosslinked microgels"
BR Nelson, BE Kirkpatrick, NP Skillin, N Di Caprio, JS Lee, LP Hibbard, GK Hach, A Khang, TJ White, JA Burdick, CN Bowman, KS Anseth, *SFB Rocky Mountain Regional Meeting 2024*
9. "Photocrosslinking of highly reconfigurable dynamic materials using 1,2-dithiolanes"
BR Nelson, BE Kirkpatrick, MT Lemon, KS Anseth, CN Bowman, *Photopolymerizations Fundamentals 2023*
8. "1,2-dithiolanes for photocrosslinking of highly reconfigurable dynamic hydrogels"
BR Nelson, BE Kirkpatrick, CE Miksch, MD Davidson, NP Skillin, GK Hach, A Khang, SN Hummel, BD Fairbanks, JA Burdick, CN Bowman, KS Anseth, *Colorado State University Polymer Day 2023*
BR Nelson received 1st place poster award
7. "Highly Reconfigurable Hydrogels Photocrosslinked by 1,2-Dithiolanes"
BR Nelson, BE Kirkpatrick, CE Miksch, MD Davidson, NP Skillin, GK Hach, A Khang, SN Hummel, BD Fairbanks, JA Burdick, CN Bowman, KS Anseth, *Rocky Mountain Biomaterials Day 2023*
- 6.* "Photoinduced Dithiolane Crosslinking, Exchange, and Depolymerization for Dynamic Hydrogels"
SN Hummel, **BR Nelson**, BE Kirkpatrick, GK Hatch, CN Bowman, KS Anseth, *AIChE Annual Student Conference 2022*
SN Hummel received 2nd place poster in Food, Pharma, and Biotech
5. "Dynamic Photoadaptable Dithiolane Crosslinking for PEG Hydrogels"
BR Nelson, BE Kirkpatrick, CN Bowman, KS Anseth, *International School of Soft Matter, Summer 2022*
4. "Influence of Shape on Optical and Heterostructure Deposition Properties of CdSe Semiconductor Nanocrystals"
BR Nelson, MB Wilker, *Luther College Undergraduate Research Symposium*
3. "Synthesis of a Hybrid Thiol-ene/Acrylate Network for Improving the Uniformity of Liquid Crystal Elastomers"
BR Nelson, MK McBride, BR Donovan, TJ White, CN Bowman, *REU Symposia*
2. "Influence of CdSe Nanocrystal Shape on Optical and Vibrational Spectra"
BR Nelson, BD Nottleson, EA Reasoner, MB Wilker, *ACS Spring 2019*
1. "Influence of CdSe Nanocrystal Shape on Vibrational Spectra"
BR Nelson, BD Nottleson, EA Reasoner, MB Wilker, *ACS Midwest Regional Meeting, Fall 2018*

Mentorship

Graduate Student Mentees

2024-Present John Rynk, CU Boulder Materials Science and Engineering PhD student

Undergraduate Mentees

2025-Present Audrey Sakamoto, CU Boulder Chemical Engineering undergraduate
2023-Present Jaxon Cione, CU Boulder Chemical Engineering undergraduate
 Jaxon was awarded a University of Colorado Undergraduate Research
 Opportunities Program Fellowship for the AY 2024-2025
2022 Sydney Hummel, Purdue University Chemical Engineering undergraduate
 Sydney received the 2nd place poster award in Food, Pharma, and Biotech at the
 AIChE Student Conference 2022 presenting work from her time at CU

International Visiting Scholars hosted

2025 Vincent Scholiers, Universiteit Ghent PhD student
2023-24 Stefanie Müller, Montanuniversität Leoben PhD student

Selected Activities

2025 Conference Technical Coordinator, Dynamic Polymer Networks 2025
 (under Profs. Chris Bowman and Filip du Prez, Conference Organizers)
2024-25 President, University of Colorado Lutheran Campus Ministry Board
2023-24 Vice President, University of Colorado Lutheran Campus Ministry Board
2022 Participant, International School of Soft Matter, Summer 2022
2017–21 Student Athlete, Luther College Norse Football, Varsity Letters 2018-21

Professional Affiliations

American Chemical Society
Phi Mu Epsilon Math Honor Society
Chi Alpha Sigma National College Athlete Honor Society
European Symposium of Photopolymer Science
Society for Biomaterials
American Institute of Chemical Engineers