

Annalise E. Maughan

amaughan@mines.edu | [Maughan Group](#) | [LinkedIn](#) | [Google Scholar](#) | @LatticeDiva
She/Her/Hers

Research Vision

My research vision is centered around crystal-chemical control of solid-state materials chemistry for renewable energy and sustainability. My interests lie in understanding the interplay between crystalline structure, electronic states, lattice dynamics, and ionic/electronic transport in functional materials for energy generation and energy storage. Through targeted synthesis of novel materials, I aim to develop materials design principles that enable advancements in energy technologies.

Employment

Assistant Professor Colorado School of Mines Department of Chemistry <i>Joint Appointment: National Renewable Energy Laboratory</i>	GOLDEN, CO <i>July 2021 – Present</i>
Director's Postdoctoral Fellow National Renewable Energy Laboratory Mentors: Dr. Joe Berry, Dr. Nate Neale Research: <i>Driving Ion Conduction with Molecular Dynamics in Solid-State Electrolytes and Discovery of new chiral hybrid organic-inorganic perovskite semiconductors for spintronics</i>	GOLDEN, CO <i>December 2018 – July 2021</i>

Education

Ph.D., Chemistry Colorado State University Department of Chemistry Advisor: Prof. James R. Neilson Dissertation: <i>Defect tolerance, anharmonicity, and organic-inorganic coupling in hybrid organic-inorganic semiconductors</i>	FORT COLLINS, CO <i>September 2013 – December 2018</i>
NSF Research Experience for Undergraduates (REU) Harvey Mudd College Advisor: Prof. Gerald van Hecke Research: <i>Thermodynamic properties of liquid crystalline cobalt stearate</i>	CLAREMONT, CA <i>Summer 2012</i>
B.S. in Chemistry, ACS Certified; Minor in Mathematics Northern Arizona University Advisor: Prof. Stephanie K. Hurst Research: <i>Synthesis of new tropylium platinum and palladium sandwich complexes</i>	FLAGSTAFF, AZ <i>2009 – 2013</i>

Group and Mentoring

Postdoctoral Scholars

Past - Dr. Christopher Rom (NREL, 2022-2023), Dr. Philip Yox (2022-2025)

Graduate Students

Current - Abby Cardoza (2023-present), Lexi Collins (MS, 2023-present), Sinclair Combs (2021-present), Shelby Galinat (2022-present), Sarah Grunsfeld (2024-present), Alex Hughes (2023-present), Yasaman Kazemipour (2023-present), Amy Louks (2022-present), Katie Palmer (2024-present), Austin Shotwell (2021-present), Rosemary Thompson (2024-present)
Past - Lucy Metzroth (MS, Materials Science; 2022-2023), Dylan Neau (Bordeaux Exchange Program; 2023), Connor Ray (MS, Applied Chemistry; 2021-2023)

Undergraduate Students

Current - Karina Davis (2025-present), John-Austin Little (2025-present), Bronwyn Maclean (2024-present), Marissa Peckham (2025-present), Mimi Rai (2024-present),
Past - Cade Alaniz (NSF REU, Summer 2024), Lucas Baker (2022-2025), Rae Earnest (NSF REU, Summer 2023), Akhil Gupta (2021-2024), Kobi Hobert (2021-2024), Jordan Sweeney (NSF REU, Summer 2022), Drew Whitney (2023-2025), Claire Willard (2024-2025), Eleni Ziu (NSF REU, Summer 2023)

Awards and Honors

- Chemistry of Materials Lectureship and Best Paper Award, 2025
- W. M. Keck Award for Graduate Mentorship, Colorado School of Mines, 2025
- Junior Faculty Research Scholar Award, Colorado School of Mines, 2024
- NSF CAREER Award, DMR-SSMC, 2024-2029
- Colorado School of Mines Department of Chemistry Outstanding Faculty Award, 2023, 2024
- NREL Foundation's Outstanding Women in STEM Award, 2023
- Featured in ACS Energy Letters "Women Scientists at the Forefront of Energy", 2021 [doi]
- Key Contributor Award – National Renewable Energy Laboratory, 2019, 2020
- Director's Postdoctoral Fellowship – National Renewable Energy Laboratory, 2018-2021
- American Chemical Society Chemistry of Materials Lectureship and Best Paper Award, 2018
- Ludo Frevel Crystallography Scholarship – International Centre for Diffraction Data (ICDD), 2017

Funding

- PI – National Science Foundation CAREER Award, 2024-2029
- PI – National Science Foundation Conference: "Integrating Large Language Models into the Chemistry Curriculum", 2023-2024
- Co-PI – National Science Foundation Research Experience for Undergraduates, 2023-2025
- Co-PI – Department of Energy Vehicle Technologies Office – National Renewable Energy Laboratory, 2022-2027
- PI – Laboratory Directed Research and Development Core Program – National Renewable Energy Laboratory, 2022-2023

Leadership and Service

PRX Energy

Member of the Editorial Board

Fall 2024 – present

Activities: Served as a member of the Editorial Board for PRX Energy, a journal in the American Physical Society portfolio.

NSF REU: "Integrating Computation and Experiment to Create Revolutionary Materials"

GOLDEN, CO

Co-Director

Spring 2023 – present

Activities: Co-directed the National Science Foundation Research Experiences for Undergraduates at Colorado School of Mines. This REU focuses on recruiting students from community colleges, with particular emphasis on students with no prior research experiences. Substantial efforts are made to recruit students from underrepresented groups. Directed program activities, organized professional development activities for REU participants and mentors, worked with experts in pedagogy to assess the impact of the program.

Graduate Fellowship Writing Workshop

GOLDEN, CO

Co-director

Summer 2023, Fall 2023, Fall 2024, Fall 2025

Activities: Voluntarily co-directed a workshop for graduate students in Applied Chemistry and Materials Science programs at Colorado School of Mines focused on writing graduate fellowships (e.g. NSF GRFP, NDSEG, NASA, etc.). Reviewed proposals, instructed students in grantsmanship, and helped students brainstorm ideas and research directions.

NSF Workshop "Integrating Large Language Models into the Materials Chemistry Curriculum"

GOLDEN, CO

Funded conference proposal, NSF Division of Materials Research

February 11-12, 2024

Activities: Led successful proposal (funded) to develop and host a pedagogical workshop focused on integrating large language models (e.g., ChatGPT, Bard) as an educational tool in the upper division chemistry curriculum. Invited attendees and speakers with expertise in artificial intelligence and chemistry pedagogy. Developed and organized workshop activities.

Chemists Who Code, Faculty advisor

GOLDEN, CO

Faculty advisor for Chemists Who Code student group, Colorado School of Mines

Summer 2024 – present

Activities: Assist student leadership team in developing and hosting coding workshops and events geared towards enhancing graduate student coding literacy

Society for Women in Chemistry (SWiC), Faculty advisor

GOLDEN, CO

Faculty advisor for Society for Women in Chemistry group, Colorado School of Mines

Fall 2020 – present

Activities: Engage with graduate and undergraduate students on the leadership team to support women in chemistry

Activities: Invited to participate as expert panelist in *Energy and Environment* subpanel to direct the future capabilities of the new research nuclear reactor to be built at National Institute of Standards and Technology Center for Neutron Research. Participated in writing a congressional report detailing the needs of future neutron research for advancements in Energy and Environment.

Teaching

- CHGN 423/523: Solid-State Chemistry (S23, S24, F24, F25)
- CHGN 351: Physical Chemistry I Laboratory (S23, F23, S24, F24, S25)
- CHGN 209: Introduction to Chemical Thermodynamics (F22, S23, F23)
- CHGN 125: Molecular Engineering and Materials Chemistry (S22)

Publications

Listed in reverse chronological order. Citation tracking at: [Google Scholar](#). Corresponding authorship is denoted by *. Undergraduate co-authors are denoted by †.

1. C. L. Rom, A. Shotwell, S. Combs, A. Peters, L. Borgia, J. R. Neilson, **A. E. Maughan***; “Ball milling enables phase-pure synthesis of a temperature sensitive ternary chloride, MgZrCl_6 ”, arXiv:2508.16066.[doi] Submitted, *RSC Mechanochemistry*
2. **A. E. Maughan***, E. S. Toberer*, A. Zevalkink*; “Integrating Large Language Models into the Chemistry and Materials Science Laboratory Curricula”, *Chem. Mater.*, **2025**, 37, 2389–2394.[doi]
3. P. Yox, G. Teeter, L. Baker†, D. Whitney†, **A. E. Maughan***; “Directing Ion Transport and Interfacial Chemistry in Pnictogen-Substituted Thio-LISICONS”, *ACS Appl. Mater. Interfaces*, **2025**, 17, 19906–19916.[doi]
4. A. M. Shotwell, M. C. Schulze, P. Yox, C. Alaniz†, **A. E. Maughan***; “Tetrahedral Tilting and Lithium-Ion Transport in Halide Argyrodites Prepared by Rapid, Microwave-Assisted Synthesis”, *Adv. Funct. Mater.*, **2025**, 2500237, 1–16.[doi]
5. S. R. Combs, **A. E. Maughan***; “PyFaults: A Python Tool for Stacking Fault Screening”, *J. Appl. Crystallogr.*, **2024**, 57, 1996–2009.[doi]
6. C. E. Ray, Y. Yao, S. L. Galinat, B. Addison, V. Blum, **A. E. Maughan***; “Site Disorder Drives Cyanide Dynamics and Fast Ion Transport in $\text{Li}_6\text{PS}_5\text{CN}$ ”, *Chem. Mater.*, **2024**, 36, 9424–9441.[doi]
7. C. L. Rom*, P. Yox, A. M. Cardoza, R. W. Smaha, M. Q. Phan†, T. R. Martin, **A. E. Maughan***; “Expanding the Phase Space for Halide-Based Solid Electrolytes: Li-Mg-Zr-Cl ”, *Chem. Mater.*, **2024**, 36, 7283–7291.[doi]
8. **A. E. Maughan***, G. Koknat, P. C. Sercel, M. K. Jana, R. Brunecky, D.B. Mitzi, J. J. Berry, V. Blum*, M. C. Beard; “Impact of Chiral Symmetry Breaking on Spin-Texture and Lone Pair Expression in Chiral Crystals of Hybrid Antimony and Bismuth Halides”, *Chem. Mater.*, **2023**, 35, 9086–9101.[doi]
9. S. R. Combs, P. K. Todd, P. Gorai, **A. E. Maughan***; “Review - Designing Defects and Diffusion in Metal Halide Solid Electrolytes”, *J. Electrochem. Soc.*, **2022**, 169, 040551. *Editor's Choice*; Invited Submission to *Focus Issue on Women in Electrochemistry*.[doi]
10. **A. E. Maughan***, Y. Ha, R. T. Pekarek, M. C. Schulze; “Lowering the activation barriers for ionic conductivity through orientational disorder in the cyanide argyrodite $\text{Li}_6\text{PS}_5\text{CN}$ ”, *Chem. Mater.*, **2021**, 33, 5127–5136.[doi]
11. E. Amerling, H. Lu, B. W. Larson, **A. E. Maughan**, A. Phillips, E. Lafalce, L. Whittaker-Brooks, J. J. Berry, M. C. Beard, Z. V. Vardeny, J. L. Blackburn; “A Multi-Dimensional Perspective on Electronic Doping in Metal Halide Perovskites”, *ACS Energy Lett.*, **2021**, 6, 1104–1123.[doi]
12. J. Yang, **A. E. Maughan**, G. Teeter, B. Tremolet de Villers, S.-M. Bak, S. D. Han*; “Structural Stabilization of P2-type Sodium Iron Manganese Oxides by Electrochemically Inactive Mg Substitution: Insights of Redox Behavior and Voltage Decay”, *ChemSusChem*, **2020**, 13, 5972–5982.[doi]
13. **A. E. Maughan**, E. M. Mozur, A. M. Candia†, J. R. Neilson*; “Ferroelastic Phase Transition in Formamidinium Tin (IV) Iodide Driven by Organic-Inorganic Coupling”, *Inorg. Chem.*, **2020**, 59, 14399–14406.[doi]

14. H. Lu, C. Xiao, R. Song, T. Li, **A. E. Maughan**, A. Levin, R. Brunecky, J. J. Berry, D. B. Mitzi, V. Blum, M. C. Beard*; “Highly distorted chiral two-dimensional tin iodide perovskites for spin polarized charge transport”, *J. Am. Chem. Soc.*, **2020**, *142*, 13030–13040.[doi]
15. T. H. Schloemer, J. A. Raiford, T. S. Gehan, T. Moot, S. Nanayakkara, S. P. Harvey, R. C. Bramante, S. Dunfield, A. E. Louks, **A. E. Maughan**, L. Bliss, M. D. McGehee, M. F. A. M. van Hest, M. O. Reese, S. F. Bent, J. J. Berry, J. M. Luther, A. Sellinger; “The molybdenum oxide interface limits the high-temperature operational stability of unencapsulated perovskite solar cells”, *ACS Energy Lett.*, **2020**, *5*, 2349–2360.[doi]
16. E. M. Mozur, M. A. Hope, J. C. Trowbridge[†], D. M. Halat, L. L. Daemen, **A. E. Maughan**, T. R. Prisk, C. P. Grey, J. R. Neilson*; “Cesium Substitution Disrupts Concerted Cation Dynamics in Formamidinium Hybrid Perovskites”, *Chem. Mater.*, **2020**, *32*, 6266–6277.[doi]
17. E. M. Mozur, J. C. Trowbridge[†], **A. E. Maughan**, M. J. Gorman[†], C. M. Brown, T. R. Prisk, J. R. Neilson*; “Dynamical Phase Transitions and Cation–Orientation Dependent Photoconductivity in CH(NH₂)₂PbBr₃”, *ACS Mater. Lett.*, **2019**, *1*, 260–264.[doi]
18. **A. E. Maughan**, A. M. Ganose, D. O. Scanlon, J. R. Neilson*; “Perspectives and Design Principles of Vacancy-Ordered Double Perovskite Semiconductors”, *Chem. Mater.*, **2019**, *31*, 1184–1195.[doi]
19. **A. E. Maughan**, A. A. Paecklar, J. R. Neilson*; “Bond Valences and Anharmonicity in Vacancy-Ordered Double Perovskite Halides”, *J. Mater. Chem. C*, **2018**, *6*, 12095–12104.[doi]
20. **A. E. Maughan**, A. M. Ganose, M. A. Almaker[†], D. O. Scanlon, J. R. Neilson*; “Tolerance Factor and Cooperative Tilting Effects in Vacancy-Ordered Double Perovskite Halides”, *Chem. Mater.*, **2018**, *30*(11), 3909–3919.[doi]
21. **A. E. Maughan**, Alex M. Ganose, Andrew M. Candia[†], Juliette T. Granger[†], David O. Scanlon, J. R. Neilson*; “Anharmonicity and Octahedral Tilting in Hybrid Vacancy-Ordered Double Perovskites”, *Chem. Mater.*, **2018**, *30*(2), 472–483.[doi]; **Selected for ACS Editor’s Choice and Cover Article; Selected for 2018 Chemistry of Materials Best Paper Award.**
22. E. M. Mozur, **A. E. Maughan**, Y.-Q. Cheng, A. Huq, N. Jalarvo, L. Daemen, J. R. Neilson*; “Orientational Glass Formation in Substituted Hybrid Perovskites”, *Chem. Mater.*, **2017**, *29*(23), 10168–10177.[doi]
23. **A. E. Maughan**, A. M. Ganose, M. M. Bordelon[†], E. M. Miller, D. O. Scanlon, J. R. Neilson*; “Defect Tolerance to Intolerance in the Vacancy-Ordered Double Perovskite Semiconductors Cs₂SnI₆ and Cs₂TeI₆”, *J. Am. Chem. Soc.*, **2016**, *138*(27), 8453–8464.[doi]
24. P. Moetakef, L. Wang, **A. E. Maughan**, K. J. Gaskell, A. M. Larson, B. C. Hodges, E. E. Rodriguez*; “Tuning the electronic band structure of microporous titanates with the hollandite structure”, *J. Mater. Chem. A*, **2015**, *3*(40), 20330–20337.[doi]
25. **A. E. Maughan**, J. A. Kurzman, J. R. Neilson*; “Hybrid Organic-Inorganic Materials with an Optoelectronically Active Aromatic Cation: (C₇H₇)₂SnI₆ and C₇H₇PbI₃”, *Inorg. Chem.*, **2015**, *54*(1), 370–378.[doi]

Patents

1. A. M. Shotwell, M. C. Schulze, **A. E. Maughan** “Rapid dry microwave synthesis of argyrodite solid-state electrolytes”, US Patent App. 63/690,003
2. C. L. Rom, P. A. Yox, T. R. Martin, **A. E. Maughan** “Chloride electrolytes for solid state lithium ion batteries and methods therefor”, US Patent App. 18/886,265
3. M. C. Beard, H. Lu, **A. E. Maughan**, J. J. Berry, Z. V. Vardeny, C. Xiao, V. Blum, D. B. Mitzi “Two-dimensional perovskite compositions and devices therefrom”, US Patent App. 17/109,668.
4. **A. E. Maughan** “Cyanide argyrodite solid electrolyte”, US Patent App. 17/206,100