Christopher J. Bartel

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Last updated: 5/20/24

Appointments

Assistant Professor, University of Minnesota — 2022 – present
Chemical Engineering and Materials Science (link)
Chemical Physics, *Graduate Faculty* (link)
Data Science Initiative, *Affiliate* (link)

Postdoctoral Scholar, University of California, Berkeley — 2019 – 2022
Materials Science and Engineering (link)
Advisor: Prof. Gerbrand Ceder

Graduate Research Assistant, University of Colorado Boulder — 2014 – 2018
Chemical Engineering (link)
Advisors: Prof. Charles Musgrave & Prof. Alan Weimer
Thesis: *Data-driven descriptors for the thermochemistry of inorganic crystalline solids*

Education

PhD University of Colorado Boulder, Chemical Engineering — 2014 – 2018
BS Auburn University, Chemical Engineering — 2010 – 2014

Publications

Google Scholar | ORCID:0000-0002-5198-5036
* denotes corresponding author, $^{+}$ denotes equal contribution, denotes Bartel research group member

UMN-affiliated

53. N. Szymanski, **C. Bartel***, Computationally guided synthesis of battery materials, *ACS Energy Letters*, **2024**, Accepted

52. S. Gathmann, **C. Bartel**, L. Grabow, O. Abdelrahman, C. Frisbie, P. Dauenhauer*, Dynamic promotion of the oxygen evolution reaction via programmable metal oxides, *ACS Energy Letters*, **2024**, 9, 2013-2023

51. K. Noordhoek, **C. Bartel***, Accelerating the prediction of inorganic surfaces with machine learning interatomic potentials, *Nanoscale*, **2024**, 16, 6365-6382

50. M. Murphy, S. Gathmann, **C. Bartel**, O. Abdelrahman, P. Dauenhauer*, Catalytic resonance theory: circumfluence of programmable catalytic loops, *Journal of Catalysis*, **2024**, 430, 115343

49. G. Tran, A. Wustrow, D. O'Nolan, S. Tao, **C. Bartel**, T. He, M. McDermott, B. McBride, K. Chapman, S. Billinge, K. Persson, G. Ceder, J. Neilson*, Selective synthesis towards defect-rich $LaMnO_3$ by low-temperature co-metathesis, *Inorganic Chemistry*, **2024**, 63, 7, 32503257

48. Y. Zeng^{+}, N. Szymanski^{+}, T. He, K. Jun, L. Gallington, H. Huo, **C. Bartel**, B. Ouyang, G. Ceder*, Selective formation of metastable polymorphs in solid-state synthesis, *Science Advances*, **2024**, 10, 3, eadj5431

47. K. Cruse, V. Baibakova, M. Abdelsamie, K. Hong, **C. Bartel**, A. Trewartha, A. Jain, C. Sutter-Fella, G. Ceder*, Text-mining the literature to inform experiments and rationalize impurity phase formation in $BiFeO_3$, *Chemistry of Materials*, **2024**, 36, 2, 772-785

46. M. McDermott, B. McBride, C. Regier, G. Tran, Y. Chen, A. Corrao, M. Gallant, G. Kamm, **C. Bartel**, K. Chapman, P. Khalifah, G. Ceder, J. Neilson, K. Persson*, Assessing thermodynamic selectivity of solid-state reactions towards predictive synthesis of inorganic materials, *ACS Central Science*, **2023**, 9 (10), 1957-1975

45. N. Szymanski, P. Nevatia, **C. Bartel**, Y. Zeng, G. Ceder*, Autonomous decision making for solid-state synthesis of inorganic materials, *Nature Communications*, **2023**, 14, 6956

44. B. Deng, P. Zhong*, K. Jun, K. Han, **C. Bartel**, G. Ceder*, CHGNet: Pretrained universal neural network potential for charge-informed molecular dynamics and beyond, *Nature Machine Intelligence*, **2023**, 5, 1031-1041

43. S. Nair, K. Noordhoek, D. Lee, **C. Bartel***, B. Jalan*, Solid source metal-organic MBE for elemental Ir and Ru films, *Journal of Vacuum Science & Technology A*, **2023**, 41 (6): 0620701

42. N. Szymanski, Z. Lun, J. Liu, Z. Cai, E. Self, **C. Bartel**, J. Nanda, B. Ouyang, G. Ceder*, Modeling short-range order in disordered rocksalt cathodes by pair distribution function analysis, *Chemistry of Materials*, **2023**, 35, 13, 49224934

41. T. He, H. Huo, **C. Bartel**, Z. Wang, K. Cruse, G. Ceder*, Precursor recommendation for inorganic synthesis by machine learning materials similarity from scientific literature, *Science Advances*, **2023**, 9, 23, adg8180

40. M. Kothakonda, A. Kaplan, E. Isaacs, **C. Bartel**, J. Furness, J. Ning, C. Wolverton, J. Perdew, J. Sun*, Testing the r^{2}SCAN density functional for the thermodynamic stability of solids with and without a van der Waals correction, *ACS Materials Au*, **2023**, 3, 2, 102-111

Prior to joining UMN

39. N. Szymanski$^+$, B. Rendy$^+$, Y. Fei$^+$, R. Kumar$^+$, T. He, D. Milsted, M. McDermott, M. Gallant, E. Cubuk, A. Merchant, H. Kim, A. Jain, **C. Bartel**, K. Persson, Y. Zeng*, G. Ceder*, An autonomous laboratory for inorganic materials discovery, *Nature*, **2023**, 624, 86-91

38. M. Abdelsamie, K. Hong, K. Cruse, **C. Bartel**, V. Baibakova, A. Trewartha, A. Jain, G. Ceder, C. Sutter-Fella*, Combining text mining, in situ characterization, and ab initio calculations to rationalize $BiFeO_3$ crystallization pathways, *Matter*, **2023**, 6(12), 4291-4305

37. N. Szymanski, **C. Bartel**, Y. Zeng, M. Diallo, H. Kim, G. Ceder*, Adaptive X-ray diffraction with automatic phase identification, *npj Computational Materials*, **2023**, 9 (1), 31

36. M. Cosby, **C. Bartel**, A. Corrao, A. Yakovenko, L. Gallington, G. Ceder, P. Khalifah*, Thermodynamic and kinetic barriers limiting solid state reactions resolved through in situ synchrotron studies of lithium halide salts, *Chemistry of Materials*, **2023**, 35, 3, 917-926

35. L. Blanc$^+$, Y. Choi$^+$, A. Shyamsunder, B. Key, S. Lapidus, C. Li, L. Yin, B. Gwalani, Y. Xiao, **C. Bartel**, G. Ceder*, L. Nazar*, Phase stability and kinetics of topotactic dual Ca^{2+}-Na^+ ion electrochemistry in NaSICON $NaV_2(PO_4)_3$, *Chemistry of Materials*, **2023**, 35, 2, 468-481

34. R. Sherbondy$^+$, R. Smaha$^+$, **C. Bartel**, M. Holtz, K. Talley, B. Levy-Wendt, C. Perkins, S. Eley, A. Zakutayev, G. Brennecka*, High-throughput selection and experimental realization of two new Ce-based nitride perovskites: $CeMoN_3$ and $CeWN_3$, *Chemistry of Materials*, **2022**, 34, 15, 6883-6893

33. H. Huo, **C. Bartel**, T. He, A. Trewartha, A. Dunn, B. Ouyang, A. Jain, G. Ceder*, Machine-learning rationalization and prediction of solid-state synthesis conditions, *Chemistry of Materials*, **2022**, 34, 16, 7323-7336

32. N. Szymanski$^+$, Y. Zeng$^+$, T. Bennett, S. Patil, J. Keum, E. Self, J. Bai, Z. Cai, R. Giovone, B. Ouyang, F. Wang, **C. Bartel**, R. Clement, W. Tong, J. Nanda, G. Ceder*, Understanding the fluorination of disordered rocksalt cathodes through rational exploration of synthesis pathways, *Chemistry of Materials*, **2022**, 34, 15, 7015-7028

31. **C. Bartel***, Review of computational approaches to predict the thermodynamic stability of inorganic solids, *Journal of Materials Science*, **2022**, 57:10475-10498 (*invited*)

30. R. O'Toole, C. Hill, P. Buur, **C. Bartel**, C. Gump, C. Musgrave, A. Weimer*, Hydrolysis protection and sintering of aluminum nitride powders with yttria nanofilms, *Journal of the American Ceramic Society*, **2022**, 105, 5, 3123-3127

29. B.J. Kwon*, L. Yin, **C. Bartel**, K. Kumar, P. Parajuli, J. Gim, S. Kim, R. Klie, S. Lapidus, B. Key, G. Ceder, J. Cabana*, Intercalation of Ca into a highly defective oxide at room temperature, *Chemistry of Materials*, **2022**, 34, 2, 836-846

28. R. Kingsbury, A. Gupta, **C. Bartel**, J. Munro, S. Dwaraknath, M. Horton, K. Persson*, Performance comparison of r^{2}SCAN and SCAN metaGGA density functionals for solid materials via an automated, high-throughput computational workflow, *Physical Review Materials*, **2022**, 6, 013801

27. Y. Chen, **C. Bartel**, M. Avdeev, Y. Zhang, P. Zhong, G. Zeng, Z. Cai, H. Kim, H. Ji*, G. Ceder*, Solid-state Ca ion diffusion in $Ca_{1.5}Ba_{0.5}Si_5O_3N_6$, *Chemistry of Materials*, **2022**, 34, 1, 128-139

26. J. Hancock, K. Griffith, Y. Choi, **C. Bartel**, S. Lapidus, J. Vaughey, G. Ceder, K. Poeppelmeier*, Expanding the ambient-pressure phase space of $CaFe_2O_4$-type sodium post spinel host-guest compounds, *ACS Organic and Inorganic Au*, **2022**, 2, 1, 8-22 (*invited* | *cover*)

25. H. Park*, **C. Bartel**, G. Ceder, P. Zapol*, Layered transition metal oxides as Ca intercalation cathodes: a systematic first-principles evaluation, *Advanced Energy Materials*, **2021**, 11, 48, 2101698

24. B. Ouyang$^+$, J. Wang$^+$, T. He, **C. Bartel**, H. Huo, Y. Wang, V. Lacivita, H. Kim, G. Ceder*, Synthetic accessibility and stability rules of NASICONs, *Nature Communications*, **2021**, 12, 5752

23. L. Blanc$^+$, **C. Bartel**$^+$, Ha. Kim, Y. Tian, Hy. Kim, A. Miura, G. Ceder*, L. Nazar*, Toward the development of a high-voltage Mg cathode using a chromium sulfide host, *ACS Materials Letters*, **2021**, 3, 1213-1220

22. L. Yin, B. Kwon, Y. Choi, **C. Bartel**, M. Yang, C. Liao, B. Key, G. Ceder, S. Lapidus*, Operando X-ray diffraction studies of the Mg-ion migration mechanisms in spinel cathodes for rechargeable Mg-ion batteries, *Journal of the American Chemical Society*, **2021**, 143, 28, 10649-10658

21. N. Szymanski, Y. Zeng, H. Huo, **C. Bartel***, H. Kim*, G. Ceder*, Toward autonomous design and synthesis of novel inorganic materials, *Materials Horizons*, **2021**, 8, 2169-2198 (*invited*)

20. N. Szymanski, **C. Bartel**, Y. Zeng, Q. Tu, G. Ceder*, Probabilistic deep learning approach to automate the interpretation of multi-phase diffraction spectra, *Chemistry of Materials*, **2021**, 33, 11, 4204-4215

19. A. Miura$^+$*, **C. Bartel**$^+$, Y. Goto, Y. Mizuguchi, C. Moriyoshi, Y. Kuroiwa, Y. Wang, T. Yaguchi, M. Shirai, M. Nagao, N. Rosero-Navarro, K. Tadanaga, G. Ceder, W. Sun*, Observing and modeling the sequential pairwise reactions that drive solid-state ceramic synthesis, *Advanced Materials*, **2021**, 33, 24, 2100312

18. J. Koettgen, **C. Bartel**, J. Shen, K. Persson, G. Ceder*, First-principles study of $CaB_{12}H_{12}$ as a potential solid-state conductor for Ca, *Physical Chemistry Chemical Physics*, **2020**, 22 (47), 27600-27604

17. **C. Bartel***, A. Trewartha, Q. Wang, A. Dunn, A. Jain, G. Ceder*, A critical examination of compound stability predictions from machine-learned formation energies, *npj Computational Materials*, **2020**, 6, 97

16. N. Singstock, **C. Bartel**, A. Holder*, C. Musgrave*, High-throughput analysis of materials for chemical looping processes, *Advanced Energy Materials*, **2020**, 14, 2000685

15. A. Miura*, H. Ito, **C. Bartel**, W. Sun*, N. Rosero Navarro, K. Tadanaga, H. Nakata, K. Maeda, G. Ceder, Selective metathesis synthesis of $MgCr_2S_4$ by control of thermodynamic driving forces, *Materials Horizons*, **2020**, 7, 1310-1316

14. **C. Bartel***, J. Clary, C. Sutton, D. Vigil-Fowler, B. Goldsmith, A. Holder, C. Musgrave*, Inorganic halide double perovskites with optoelectronic properties modulated by sublattice mixing, *Journal of the American Chemical Society*, **2020**, 142, 11, 5135-5145 (*correction*)

13. J. Koettgen, **C. Bartel**, G. Ceder*, Computational investigation of chalcogenide spinel conductors for all-solid-state Mg batteries, *Chemical Communications*, **2020**, 56, 1952-1955

12. E. Rognerud$^+$, C. Rom$^+$, P. Todd, N. Singstock, **C. Bartel**, A. Holder, J. Neilson*, Kinetically controlled low-temperature solid-state metathesis of manganese nitride Mn_3N_2, *Chemistry of Materials*, **2019**, 31, 18, 7248-7254

11. W. Sun*, **C. Bartel**, E. Arca, S. Bauers, B. Matthews, B. Orvañanos, J. Tate, W. Tumas, A. Zakutayev, S. Lany, A. Holder*, G. Ceder, A map of the inorganic ternary metal nitrides, *Nature Materials*, **2019**, 18, 732-739

10. **C. Bartel**, J. Rumptz, A. Weimer, A. Holder*, C. Musgrave*, High-throughput equilibrium analysis of active materials for solar thermochemical ammonia synthesis, *ACS Applied Materials & Interfaces*, **2019**, 11, 28, 24850-24858 (*invited*)

9. A. Palumbo, **C. Bartel**, J. Sorli, A. Weimer*, Characterization of products derived from the high temperature flash pyrolysis of microalgae and rice hulls, *Chemical Engineering Science*, **2019**, 196, 527-537

8. **C. Bartel***, C. Sutton, B. Goldsmith, R. Ouyang, C. Musgrave, L. Ghiringhelli*, M. Scheffler, New tolerance factor to predict the stability of perovskite oxides and halides, *Science Advances*, **2019**, 5, eaav0693

7. **C. Bartel**, A. Weimer, S. Lany, C. Musgrave*, A. Holder*, The role of decomposition reactions in assessing first-principles predictions of solid stability, *npj Computational Materials*, **2019**, 5 (1), 4

6. R. O'Toole^{+}, **C. Bartel**$^{+}$, M. Kodas, A. Horrell, S. Ricote, N. Sullivan, C. Gump, C. Musgrave, A. Weimer*, Particle atomic layer deposition of alumina for sintering yttria-stabilized cubic zirconia, *Journal of the American Ceramic Society*, **2019**, 102 (5) 2283-2293

5. **C. Bartel**, S. Millican, A. Deml, J. Rumptz, W. Tumas, A. Weimer, S. Lany, V. Stevanović, C. Musgrave*, A. Holder*, Physical descriptor for the Gibbs energy of inorganic crystalline solids and temperature-dependent materials chemistry, *Nature Communications*, **2018**, 9, 4168

4. B. Goldsmith*, J. Esterhuizen, J. Liu, **C. Bartel**, C. Sutton, Machine learning for heterogeneous catalyst design and discovery, *AIChE Journal*, **2018**, 64 (7), 2311-2323 (*invited* | *cover*)

3. E. Arca*, S. Lany, J. Perkins, **C. Bartel**, J. Mangum, W. Sun, A. Holder, G. Ceder, B. Gorman, G. Teeter, W. Tumas, A. Zakutayev*, Redox-mediated stabilization of zinc molybdenum nitride, *Journal of the American Chemical Society*, **2018**, 140 (12), 4293-4301 (*cover*)

2. S. Zhang, E. Yu., S. Gates, W. Cassata, J. Makel, A. Thron, **C. Bartel**, A. Weimer, R. Faller, P. Stroeve, J. Tringe*, Helium interactions with alumina formed by atomic layer deposition show potential for mitigating problems with excess helium in spent nuclear fuel, *Journal of Nuclear Materials*, **2018**, 499, 301-311

1. **C. Bartel**, C. Muhich, A. Weimer*, C. Musgrave*, Aluminum nitride hydrolysis enabled by hydroxyl-mediated surface proton hopping, *ACS Applied Materials & Interfaces*, **2016**, 8 (28), 18550-18559

2 other publications

2. **C. Bartel**, R. O'Toole, M. Kodas, A. Weimer, Core-shell ceramic particle colloidal gel and solid oxide fuel cell electrolyte, **2023**, US Patent No. 11,613,502 B2

1. **C. Bartel***, Data-centric approach to improve machine learning models for inorganic materials, *Patterns*, **2021**, 2, 11, 100361 (*invited preview*)

Honors & Awards

Scialog Fellow in Sustainable Minerals, Metals, and Materials 2024
Selected as one of ∼50 early-career faculty fellows (link)

Emerging Investigator, *Nanoscale* 2024

Scialog Fellow in Negative Emission Science 2023
Selected as one of ∼50 early-career faculty fellows (link)

Outstanding Reviewer for *Materials Horizons* 2020
One of 10 selected for number, timeliness, and quality of reviews (link)

Max S. Peters Outstanding Graduate Student Award 2019
Awarded annually to the top Ph.D. graduate in Chemical Engineering at CU-Boulder

DOE EFRC Team Science Competition Winner 2019
One of 6 winners from 40 EFRC teams (link)

University of Washington Distinguished Young Scholars Seminar 2019
One of 8 selected speakers from >100 applicants (link)

Department of Education GAANN Fellowship (×2) 2017, 2018
Provided full tuition and graduate stipend for 15 months

National Science Foundation Graduate Research Fellowship 2014 – 2017
Provided full tuition and graduate stipend for 36 months

Department of Chemical and Biological Engineering Service Award (×2) 2016, 2017
Awarded for leading the organization of volunteering and outreach events

Teaching

Course Instructor
University of Minnesota — Chemical Engineering and Materials Science

ChEn/MatS 5802 – Applied ML in Chemical and Materials Engineering
Spring 2023 (5.8), Spring 2024 (5.8)

ChEn 3201 – Numerical Methods in Chemical Engineering Applications
Fall 2024

ChEn 3005 – Transport Phenomena: Momentum and Heat
Fall 2022 (5.5), Fall 2023 (5.7)

Ratings in parentheses are average Student Rating of Teaching scores for "Instructor Overall" (max = 6.0)

Service (UMN)

Research Supervision (Bartel Research Group) 2022 – present
Postdoctoral Researchers
Dr. Nathan Szymanski (2024–)
Dr. Madhulika Mazumder (2023–2024)
Postdoc, University of Birmingham (UK)
Graduate researchers (PhD)
Adelina Carr (2023–)
Armand Lannerd (2023–)
Yi-Ting (Chris) Cheng (2022–)
Kyle Noordhoek (2022–)
Jane Schlesinger (2022–)
Undergraduate researchers
Talia Glinberg (2024–)
Jerome Kappuzha (2024–)
Simon Hjaltason (2023–)
Jacob Nelson (2023–)
Sean Sullivan (2022–2024)

Graduate Admissions Committee 2022 – present
Ph.D. Materials Science (link)
M.S. Data Science for Chemical Engineering and Materials Science (link)

CSE Data Science Initiatve | Ambassador to CEMS 2024 – present

CEMS Faculty Search Committee 2023 – 2024

Faculty judge | UMN Chemistry Graduate Student Research Symposium 2023

Service (external)

Early Career Advisory Board Member 2023 – present
Materials Today Energy

Co-organizer | Peter O. Stahl Advanced Design Forum (link) 2023, 2024

Session co-organizer & co-chair | AIChE Annual Meeting
CoMSEF: Machine Learning for Hard and Soft Materials 2023, 2024
MESD: Accelerated Discovery of Inorganic Materials 2023, 2024

Co-organizer | UMN Data Science Initiative ML for Materials Workshop (link) 2023

Instructor | i-CoMSE Summer School on Machine Learning for Molecular Science (link) 2023

Co-organizer | Industrial Perspectives on Data Science in Chem. and Adv. Mater. (link) 2022

Peer Reviewer 2018 – present

Funding agencies: *US Department of Energy* (BES-CMS, BES-CCS, BES-MSE, ASCR, SCGSR), *ACS Petroleum Research Fund* (DNI, UNI), *United Kingdom Research and Innovation* (EPSRC), *Swiss National Science Foundation*

ACS: *Journal of the American Chemical Society*, *ACS Energy Letters*, *Chemistry of Materials*, *ACS Materials Letters*, *Accounts of Materials Research*, *Journal of Chemical Theory and Computation*, *Journal of Physical Chemistry C*, *ACS Omega*

RSC: *Energy and Environmental Science*, *Materials Horizons*, *Chemical Science*, *Digital Discovery*, *Journal of Materials Chemistry A*, *Physical Chemistry Chemical Physics*, *Catalysis Science and Technology*

APS: *PRX Energy*, *Physical Review Materials*

AIP: *Applied Physics Letters*, *APL Materials*, *Journal of Applied Physics*

NPG: *Nature Computational Science*, *Nature Communications*, *npj Computational Materials*

Cell Press: *Matter*, *Patterns*

Wiley: *Advanced Materials*

Elsevier: *Materials Today Energy*, *Journal of Materials Science*, *Computational Materials Science*, *Journal of Physics and Chemistry of Solids*

Invited Presentations

Since joining UMN

31. **Midwest Machine Learning Symposium** | Minneapolis, MN | May 20, 2024
AI for Science

30. **3M** | Woodbury, MN | May 1, 2024
Computational Technology Symposium (Keynote Speaker)

29. **MRS Spring Meeting** | Seattle, WA | April 22, 2024
Integrating Machine Learning and Simulations for Materials Modeling

28. **Cabot Corporation** | Bostom, MA (virtual) | March 20, 2024
Technology Seminar

27. **ACS Midwest-Great Lakes Regional Meeting** | St. Louis, MO | October 18, 2023
Theoretical Chemistry

26. **Society of Engineering Science Annual Meeting** | Minneapolis, MN | October 8, 2023
Interatomic Models in Materials Simulations: Theory, Standards, Infrastructure, and Applications

25. **Mach Conference** | Baltimore, MD | April 7, 2023
Systems for Fitting, Uncertainty Quantification, Selection, and Use of Interatomic Models

24. **UMN Electrical and Computer Engineering** | Minneapolis, MN | March 17, 2023
Magnetic Seminar

23. **IIT Delhi: Tryst** | Delhi, India (virtual) | February 15, 2023
Department of Chemical Engineering Learning Webinar

22. **AIChE Annual Meeting** | Phoenix, AZ | November 18, 2022
Fundamental Theory and Characterizations for Optoelectronic Materials

21. **UMN Aerospace Engineering & Mechanics** | Minneapolis, MN | October 4, 2022
Solid Mechanics Research Seminar

20. **UMN CSE Data Science Initiative** | Minneapolis, MN | September 28, 2022
Machine Learning Seminar Series

Prior to joining UMN

19. **U of Toronto Chemical Engineering & Applied Chemistry** | Toronto, ON | March 22, 2022
Department seminar

18. **UC Irvine Materials Science and Engineering** | Irvine, CA | March 17, 2022
Department seminar

17. **University of Utah Chemical Engineering** | Salt Lake City, UT | March 10, 2022
Department seminar

16. **U of Maryland Chemical & Biomolecular Engineering** | College Park, MD | March 7, 2022
Department seminar

15. **TMS Annual Meeting** | Anaheim, CA | February 28, 2022
Phase Stability, Transformations, and Reactive Formation in Electronic Materials XXI

14. **U Minnesota Chemical Engineering & Materials Science** | Minneapolis, MN | Feb 22, 2022
Department seminar

13. **OSU Chemical & Biological Engineering** | Columbus, OH (*virtual*) | February 15, 2022
Department seminar

12. **NC State University Chemical & Biomolecular Engineering** | Raleigh, NC | February 9, 2022
Department seminar

11. **University of Utah Chemistry** | Salt Lake City, UT (*virtual*) | January 31, 2022
Department seminar

10. **University of Florida Chemical Engineering** | Gainesville, FL | January 24, 2022
Department seminar

9. **University of Virginia Chemical Engineering** | Charlottesville, VA | January 20, 2022
Department seminar

8. **Indiana University Chemistry** | Bloomington, IN | January 12, 2022
Department seminar

7. **SUNY Buffalo Materials Design and Innovation** | Buffalo, NY | December 17, 2021
Department seminar

6. **TMS Annual Meeting** | Orlando, FL (virtual) | March 18, 2021
Phase Stability, Transformations, and Reactive Formation in Electronic Materials X (link)

5. **Northeastern University Chemical Engineering** | Bostom, MA (*virtual*) | February 19, 2021
Department seminar

4. **ASM International IMAT** | Cleveland, OH | September 2020 (canceled due to COVID-19)
Materials 4.0: Materials Information in the Product Life Cycle

3. **Georgia Tech Chemical & Biomolecular Engineering** | Atlanta, GA | January 13, 2020
Department seminar

2. **Lawrence Berkeley National Laboratory** | Berkeley, CA | August 12, 2019
Digital Solar Redox Materials Design Workshop

1. **University of Washington Chemical Engineering** | Seattle, WA | July 1, 2019
Distinguished Young Scholars Seminar Series (link)