

# CHRISTOPHER J. BARTEL

Bartel.ChrisJ@gmail.com | [Google Scholar](#) | [Website](#)  
2130 Bonar St. Apt. C Berkeley, CA 94702 USA | +1 985 502 1870

## Education

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

## Professional Experience

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**Postdoctoral Scholar**, University of California, Berkeley May 2019 – present  
Materials Science & Engineering  
Advisor: Prof. Gerbrand Ceder

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

## Funded Proposals

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Primary contributor (>50%) on **three funded proposals** totaling **\$1,021,658** (NSF ×3)  
Significant contributor (~30%) on **one funded proposal** totaling **\$1,111,270** (DOE ×1)

1. **C. Bartel**, A. Holder (co-PI), C. Musgrave (PI), Automated Search for Materials for Ammonia Synthesis and Water Splitting, NSF Division of Chemical, Biological, Environment, and Transport Systems, Award No. 1806079, September 2018 – August 2021, \$136,329
2. **C. Bartel**, A. Holder (co-PI), C. Musgrave (PI), Machine Learned Free Energies of Compounds, NSF Division of Chemistry, Award No. 1800592, September 2018 – August 2021, \$517,497
3. S. Millican, **C. Bartel**, R. Trottier, Z. Bare, A. Holder, A. Weimer (co-PI), C. Musgrave (PI), Computationally Accelerated Discovery and Experimental Demonstration of High-Performance Materials for Advanced Solar Thermochemical Hydrogen Production, DOE EERE Fuel Cell Technologies Office, Award No. DE-EE000808, September 2017 – September 2020, \$1,111,270
4. **C. Bartel**, J. Walsh (co-PI), R. Hall (co-PI), C. Musgrave (co-PI), A. Weimer (PI), Core/Shell Sinterable Advanced Ceramic Materials Using Particle Atomic Layer Deposition, NSF Division of Civil, Mechanical and Manufacturing Innovation, Materials Engineering and Processing Program, Award No. 1563537, July 2016 – June 2019, \$367,832

## Publications

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**15 published papers** (14 since 2018 | 7 first author)

Average impact factor (IF) = 11.5 (9.8 first author only)

Journals include *JACS* (1st author), *Science Advances* (1st), *Nature Comms* (1st), *Nature Materials* (2nd)

(\* denotes corresponding, \*\* denotes equal contribution)

1. A. Miura\*, H. Ito, **C. Bartel**, W. Sun\*, N. Rosero Navarro, K. Tadanaga, H. Nakata, K. Maeda, G. Ceder, Selective metathesis synthesis of  $\text{MgCr}_2\text{S}_4$  by control of thermodynamic driving forces, *Mater. Horizons*, **2020**, Advance Article (IF = 14.4) [{Link}](#)
2. **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, *J. Am. Chem. Soc.*, **2020**, ASAP Article (IF = 14.7) [{Link}](#)
3. J. Koettgen, **C. Bartel**, G. Ceder\*, Computational investigation of chalcogenide spinel conductors for all-solid-state Mg batteries, *ChemComm*, **2020**, 56, 1952-1955 (IF = 6.2) [{Link}](#)
4. E. Rognerud\*\*, C. Rom\*\*, P. Todd, N. Singstock, **C. Bartel**, A. Holder, J. Neilson\*, Kinetically controlled low-temperature solid-state metathesis of manganese nitride  $\text{Mn}_3\text{N}_2$ , *Chem. Mater.*, **2019**, 31, 18, 7248-7254 (IF = 10.2) [{Link}](#)
5. 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, *Nat. Mater.*, **2019**, 18, 732-739 (IF = 46.9) [{Link}](#)

6. **C. Bartel**, J. Rumptz, A. Weimer, A. Holder\*, C. Musgrave\*, High-throughput equilibrium analysis of active materials for solar thermochemical ammonia synthesis, *ACS App. Mater. Interfaces*, **2019**, 11, 28, 24850-24858 (IF = 8.5) [{Link}](#)
7. A. Palumbo, **C. Bartel**, J. Sorli, A. Weimer\*, Characterization of products derived from the high temperature flash pyrolysis of microalgae and rice hulls, *Chem. Eng. Sci.*, **2019**, 196, 527-537 (IF = 3.4) [{Link}](#)
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, *Sci. Adv.*, **2019**, 5, eaav0693 (IF = 12.8) [{Link}](#)
9. **C. Bartel**, A. Weimer, S. Lany, C. Musgrave\*, A. Holder\*, The role of decomposition reactions in assessing first-principles predictions of solid stability, *Npj Comput. Mater.*, **2019**, 5 (1), 4 (IF = 9.2) [{Link}](#)
10. 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, *J. Am. Ceram. Soc.*, **2019**, 102 (5) 2283-2293 (IF = 3.1) [{Link}](#)
11. **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, *Nat. Commun.*, **2018**, 9, 4168 (IF = 11.9) [{Link}](#)
12. B. Goldsmith\*, J. Esterhuizen, J. Liu, **C. Bartel**, C. Sutton, Machine learning for heterogeneous catalyst design and discovery, *AIChE J.*, **2018**, 64 (7), 2311-2323 [cover article] (IF = 3.5) [{Link}](#)
13. 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, *J. Am. Chem. Soc.*, **2018**, 140 (12), 4293-4301 [cover article] (IF = 14.7) [{Link}](#)
14. 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, *J. Nucl. Mater.*, **2018**, 499, 301-311 (IF = 2.5) [{Link}](#)
15. **C. Bartel**, C. Muhich, A. Weimer\*, C. Musgrave\*, Aluminum nitride hydrolysis enabled by hydroxyl-mediated surface proton hopping, *ACS App. Mater. Interfaces*, **2016**, 8 (28), 18550-18559 (IF = 8.5) [{Link}](#)

## 2 papers under review

1. N. Singstock, **C. Bartel**, A. Holder\*, C. Musgrave\*, High-throughput analysis of materials for chemical looping processes, *Adv. Energy Mater.*, Submitted [{Link}](#)
2. **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 Comput. Mater.*, Under review [{Link}](#)

## Honors and Awards

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<b>Max Peters Outstanding Graduate Student Award</b>	2019
Awarded to one student in Chemical & Biological Engineering at CU-Boulder	
<b>DOE EFRC Team Science Competition Winner</b>	2019
One of 6 winners from 40 EFRC teams	
<b>University of Washington Distinguished Young Scholars Seminar</b>	2019
One of 8 selected speakers from >100 applicants	
<b>Department of Education GAANN Fellowship</b>	2017 – 2018
Provided full graduate stipend for 15 months	
<b>National Science Foundation Graduate Research Fellowship</b>	2014 – 2017
Provided full graduate stipend for 36 months	
<b>Department of Chemical and Biological Engineering Service Award</b>	2016, 2017
Awarded for leading the organization of volunteering and outreach events	

## Outreach

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<b>Co-chair Graduate Leadership Council Service Department</b> Planned and led volunteering and outreach events for Chem. E. graduate department	2015 – 2018
<b>Tutor &amp; Session Chair: NOMAD Summer School</b> Hands-on course for novel materials discovery	2018
<b>Student Co-organizer: Intl. Conference for Ternary and Multinary Compounds</b> College of Engineering and Applied Sciences Graduate Mentorship Program	2018
Developed and participated in workshops to foster positive mentor-mentee relationships	2017

## Teaching Experience

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### Graduate Teaching Assistant

University of Colorado Boulder, Chemical Engineering

- 1. Graduate Analytical Methods for Chemical Engineers** Fall 2016  
Instructor: Professor Will Medlin (will.medlin@colorado.edu)  
Role: Lead TA  
Student evaluation: Course overall – 5.1/6; Instructor overall – 5.4/6
- 2. Undergraduate Chemical Engineering Thermodynamics** Fall 2014  
Instructor: Prof. John Falconer (john.falconer@colorado.edu)  
Role: Junior TA  
Student evaluation: Course overall – 5.1/6; Instructor overall – N/A (no score for Junior TA)

## Presentations

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### 6 invited talks ([YouTube link to #3](#))

- C. Bartel**, G. Ceder, Is machine learning the formation energy sufficient to accelerate materials discovery? ASM International IMAT 2020, Cleveland, OH, September 15, 2020
- C. Bartel**, Data-driven descriptors for solid-state materials discovery, Georgia Tech, School of Chemical & Biomolecular Engineering, Atlanta, GA, January 13, 2020
- C. Bartel**, Thermal approaches to solar fuels, UC-Berkeley MSE 136 – Materials in Energy Technologies, Berkeley, CA, October 2, 2019 (guest lecture)
- C. Bartel**, Machine learning for the prediction of materials properties, Digital Solar Redox Materials Design Workshop, Lawrence Berkeley National Laboratory, Berkeley, CA, August 12, 2019
- C. Bartel**, Predictive descriptors for the stability of solid-state materials, University of Washington Distinguished Young Scholars Seminar, Seattle, WA, July 1, 2019 [[YouTube](#)]
- 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, Application of Machine Learning and Data Analytics for Energy Materials Network Consortia 2018, Lawrence Livermore National Laboratory, Livermore, CA, May 3, 2018

**Presented 18 contributed talks as 1st author** (includes AIChE, ACS, APS, MRS, EMRS)

## References

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- Prof. Gerbrand Ceder** | gceder@berkeley.edu | +1 510 486 7193  
*Daniel M. Tellep Distinguished Professor in Engineering*  
University of California, Berkeley | Materials Science & Engineering
- Prof. Charles Musgrave** | charles.musgrave@colorado.edu | +1 303 735 0411  
*Professor and Department Chair*  
University of Colorado Boulder | Chemical and Biological Engineering
- Prof. Alan Weimer** | alan.weimer@colorado.edu | +1 303 492 3759  
*H.T. Sears Memorial Professor*  
University of Colorado Boulder | Chemical and Biological Engineering