Allison Wustrow

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RESEARCH GOALS

I am a solid state chemist with an expertise in synthesis, experience studying battery materials, and an interest in "less than perfect systems": those with defects and metastable materials which cannnot be easily identified an studied using computational models. I am interested in the relationships between synthesis, structure and properties which lies at the heart of studies into crystalline materials.

EMPLOYMENT

Assistant Professor 2022-Present
Department of Chemistry, Université de Sherbrooke, Sherbrooke, QC, Canada

Post Doctoral Researcher 2019 - 2021
Colorado State University, Fort Collins, CO, USA
Research Topic: *Reaction Pathways in Ternary Solid State Metathesis Reactions*
Advisor: James R. Neilson

EDUCATION

Ph.D. in Chemistry 2014 - 2019
Northwestern University, Evanston, IL, USA
Thesis Title: *Making Magnesium Mobile: Cathodes for Multivalent Battery Systems*
Advisor: Kenneth R. Poeppelmeier

B.S. in Chemistry, High Honors 2010 - 2014
University of California, Berkeley, Berkeley, CA, USA
Research Topic: *High Pressure Phase Transitions in CdSe Quantum Dots*
Advisor: A. Paul Alivisatos

ADDITIONAL RESEARCH EXPERIENCE

Guest Graduate Appointment 2015 - 2019
Argonne National Laboratory, Lemont, IL, USA
Research Topic: *Magnesium Insertion and Intercalation in Battery Cathodes*
Advisor: John T. Vaughey

Summer Research Intern Summer 2014
National Institute for Materials Science, Tsukuba, Japan
Research Topic: *Boride Thermoelectrics for High Temperature Applications*
Advisor: Takao Mori

Summer Research Intern Summer 2013
Pennsylvania State University, State College, PA, USA
Research Topic: *Vertical Self Assembly of Nanowires in Microwells*
Advisor: Christine D. Keating

12.) Z. Thatcher, C-H. Liu, L. Yang, B. C. McBride, G. T. Tran, **A. Wustrow**, M. A. Karlsen, J. R. Neilson, D. B. Ravnsbaek, S. J. L. Billinge. nmfMapping: a cloud based web application for non-negative matrix factorization of powder diffraction and pair distribution function datasets. *Submitted* [arXiv]

11.) **A. Wustrow**, J. R. Neilson. Metathesis Routes to Materials. In *Comprehensive Inorganic Chemistry III*, 75 Elsevier, *Submitted*

10.) C. L. Rom, M. J. Fallon, **A. Wustrow**, A. L. Prieto, J. R. Neilson. Bulk synthesis, structure and electronic properties of magnesium zirconium nitride solid solutions. *Chem. Mater.* **2021** 33, 5345-5354 [doi]

9.) **A. Wustrow**, G. Huang, M. J. McDermott, D. O'Nolan, C-H. Liu, G. T. Tran, B. C. McBride, K. W. Chapman, S. J. L. Billinge, K. A. Persson, K. Thornton, J. R. Neilson. Lowering ternary oxide synthesis temperatures by solid state cometathesis reactions. *Chem. Mater.* **2021** 33, 3692-3701 [doi]

8.) C-H. Liu, C. J. Wright, R. Gu, S. Bandi, **A. Wustrow**, P. Todd, D. O'Nolan, M. Beauvais, J. R. Neilson, P. J. Chupas, K. W. Chapman, S. J. L. Billinge. Validation of non-negative matrix factorization for assessment of atomic pair-distribution function (PDF) data in a real-time streaming context. *J. Appl. Cryst.* **2021** 54, 768-775 [doi]

7.) P. K. Todd*, **A. Wustrow***, R. D. McAuliffe*, M. J. McDermott*, G. T. Tran, B. C. McBride, E. D. Boeding, D. O'Nolan, C-H. Liu, S. S. Dwaraknath, K. W. Chapman, S. J. L. Billinge, K. A. Persson, A. Huq, G. M. Veith, J. R. Neilson, Defect-accommodating intermediates yield selective low-temperature synthesis of $YMnO_3$ polymorphs. *Inorg. Chem.* **2020** 59, 13639–13650 [doi]

6.) D. O'Nolan, G. Huang, G. E. Kamm, A. Grenier, C-H. Liu, P. K. Todd, **A. Wustrow**, G. T. Tran, D. Montiel, J. R. Neilson, S. J. L. Billinge, P. J. Chupas, K. S. Thornton, K. W. Chapman, A termal-gradient approach to variable-temperature measurements in resolved space. *J. Appl. Cryst.* **2020** 53, 662-670 [doi]

5.) C. Franco, **A. Wustrow**, B. Xia, A. M. Baccarella, F. Burgos, J. Nicasio, E. Dooryhee, J. R. Neilson, J. W. Simonson, Optimized *in situ* crystal growth and disordered quasi-one-dimensional magnetism in $Li_2Mn_2(MoO_4)_3$. *Phys. Rev. Mater.* **2020** 4, 045404 [doi]

4.) **A. Wustrow**, J. C. Hancock, M. Holland, N. Charles, J. M. Rondinelli, K. R. Poeppelmeier. Two closely related polymorphs of ammonium trifluorooxovanadate. *J. Solid State Chem.* **2019** 276, 261-265 [doi]

3.) **A. Wustrow**, J. C. Hancock, J. T. Incorvati, J. T. Vaughey, K. R. Poeppelmeier. The effect of fluoride doping on lithium diffusivity in layered molybdenum oxide. *ACS Appl. Energy Mater.* **2019**, 2, 2080-2086 [doi]

2.) **A. Wustrow**, B. Key, P. J. Phillips, N. Sa, A. S. Lipton, R. F. Klie, J. T. Vaughey, K. R. Poeppelmeier. Synthesis and Characterization of $MgCr_2S_4$ Thiospinel as a Potential Magnesium Cathode. *Inorg. Chem.* **2018**, 57, 8634-8638 [doi]

1.) K. Rickert, A. Huq, S. H. Lapidus, **A. Wustrow** D. E. Ellis, K. R. Poeppelmeier. Site dependency of the high conductivity of $Ga_2In_6Sn_2O_{16}$: The role of the 7-coordinate site. *Chem. Mater.* **2015**, 27, 8084-8093 [doi]

* denotes equal contribution to the work.

TEACHING AND MENTORING

Guest Lecturer Colorado State University
Chem 511 - Solid State Chemistry *Fall 2019*

- Gave guest lectures to a graduate class on real world applications of solid state chemistry

Graduate Teaching Assistant Northwestern University
Chem 333 - Inorganic Chemistry *Fall 2015, Fall 2016*

- Created and graded quizzes and examinations for a class of 40 undergraduates
- Led review sessions and gave lectures when head instructor was not available
- Nominated by students for a teaching award

Chem 350 - Advanced Undergraduate Laboratory *Winter 2015, Spring 2015, Winter 2016*

- Redesigned laboratory experiment on YBCO to reinforce the skill of reading phase diagrams
- Advised undergraduates on independent projects, particularly those requiring X-ray diffraction

Chem 181/182 - Accelerated General Chemistry *Fall 2014, Winter 2015*

- Led laboratory sections and held office hours for general chemistry
- Volunteered as a poster judge in subsequent terms for end of term projects

Research Mentor

- Mentored graduate students including: Brennan McBride (Colorado State University), Gia Thinh Tran (Colorado State University) and Matthew Nisbet (Northwestern University)
- Mentored undergraduate students including: Yue Qi (Peking University), Mohammad Saeed (North Carolina State University) and Katherine Shin (Northwestern University)

SERVICE AND OUTREACH

Solid State Journal Club Chair March 2020 - Present

- Founded and led a weekly journal club to spark discussion during the COVID-19 outbreak.
- Invited students and post docs from multiple institutions to participate to facilitate networking.

Museum Volunteer August 2019 - Present
Fort Collins Museum of Discovery

- Ran weekly hands on exhibit teaching kids age 1 to 92 about electrical circuits.
- "Ask a Scientist" guest as part of the museums virtual programming during COVID-19.

Association of Students and Post-Docs Founder October 2019 - May 2019
Joint Center for Energy Storage Research

- Founded an organization to connect early career scientists across JCESR
- Hosted biweekly online meetings to share ideas and obtain mentorship across five research thrusts

Service Chair July 2017 - July 2018
Phi Lambda Upsilon Alpha Gamma Chapter

- Organized outreach events for the Northwestern chemistry department honor society
- Coordinated 50 volunteers and prepared lessons for monthly visits to an elementary school

Science in your Community Center Volunteer April 2017 - May 2019
EvanSTEM

- Mentored underrepresented middle school students through monthly engineering challenges

PRESENTATIONS

A. Wustrow, M. McDermott, G. T. Tran, B. C. McBride, D. O'Nolan, C-H Liu, S. J. L. Billinge, K. W. Chapman, K. A. Persson, J. R. Neilson.Side Products in the Solid State: Understanding and Controlling Reaction Pathways and Products. Symposium Annuel de Chimie Inorganique du Québec, Sherbrooke, QC, Canada **August 2021**

A. Wustrow, M. McDermott, G. T. Tran, B. C. McBride, D. O'Nolan, C-H Liu, S. J. L. Billinge, K. W. Chapman, K. A. Persson, J. R. Neilson. Defect Dictated Reaction Pathways in Ternary Oxide Metathesis. Oral Presentation at The North American Solid State Chemistry Conference, Los Angeles, CA, USA **July 2021**

A. Wustrow,N. Sa, P. J. Philips, R. F. Klie, J. T. Vaughey, K. R. Poeppelmeier. Synthesis and Electrochemical Characterization of $MgCr_2S_4$ as a Magnesium Battery Cathode. Poster Presentation at The North American Solid State Chemistry Conference, Golden, CO, USA **July 2019**

A. Wustrow, J. T. Vaughey, K. R. Poeppelmeier. Developing Cathode Materials for Magnesium Ion Batteries. Oral Presentation at Colorado State University, Fort Collins, CO, USA **October 2018**

A. Wustrow, J. T. Incorvati, J. C. Hancock, J. T. Vaughey, K. R. Poeppelmeier. Developing Synthetic Routes of Magnesium Battery Cathodes. Oral Presentation at The 232nd Electrochemical Society Meeting, National Harbor, MD, USA **October 2017**

AWARDS

- ACS Editors Choice 2021
  Lowering Ternary Oxide Synthesis Temperatures by Solid-State Cometathesis Reactions
- Outstanding Graduate Student Teacher Award 2017
- NSF Graduate Research Fellowship Program Honorable Mention 2016
- Ryan Fellowship 2014-2016
- Koo Liu Siok-Han Award for Academic Excellence 2014

LANGUAGES

- English - Native
- French - Advanced
- Mandarin Chinese - Beginner