

Rebecca D. McAuliffe

rmcauli2@illinois.edu • publish.illinois.edu/rebecca-mcauliffe • +1-608-422-9301

Education

2013-present Ph.D. Candidate in Materials Science, University of Illinois at Urbana-Champaign

Tentative Thesis Title: "In-situ X-ray reduction technique for phase exploration"

Advised by Professor Daniel P. Shoemaker

2009-2013 B.S. in Physics, *magna cum laude*, Marquette University

Advised by Professor Andrew Kunz

Research Interests

2015-present Understanding reduction reactions using in-situ X-ray diffraction

Materials Science and Engineering Department, UIUC

Reduction reactions can be used as a low-temperature synthesis technique to alter the stoichiometry of compounds as well as synthesize new structures. Structural changes were characterized using in-situ X-ray diffraction in a laboratory diffractometer and at beamline 17-BM at APS.

2015-present Development of in-situ X-ray diffraction techniques

Materials Science and Engineering Department, UIUC

In-situ flow cell was fabricated for a laboratory diffractometer. Protocols were developed to maximize signal-to-noise ratio and refine data using internal standards to increase accurate of laboratory results.

2015-present Structure determination of new materials using X-ray and neutron diffraction

Materials Science and Engineering Department, UIUC

Synthesized high-purity samples of new compounds to characterize their structure and properties. SEM-EDS and X-ray fluorescence were used to characterize overall chemical content and high-resolution X-ray and neutron diffraction were performed to solve crystal structures using TOPAS.

2013-present Magnetism in transition metal chalcogenides

Materials Science and Engineering Department, UIUC

Studied the effects of site ordering, stoichiometry, and site substitution on antiferromagnetic behavior using SQUID measurements and neutron diffraction using POWGEN and HB-2A at Oak Ridge National Laboratory.

2012 Investigation of superfluidity and Bose-Einstein condensation in ^4He

Advised by Professor J. Woods Halley – Physics Department. University of Minnesota – Twin Cities

Maintained and operated dilution refrigerator to research the possible connection between superfluidity and Bose-Einstein condensation in ^4He .

2011 Domain wall interactions in nanowires for memory storage devices

Advised by Professor Andrew Kunz – Physics Department. Marquette University

Simulated and modeled magnetic domain wall interactions in neighboring nanowires using LLG Micromagnetics Simulator and MATLAB.

Publications

5. **R. D. McAuliffe** and D. P. Shoemaker. Inflexible stoichiometry in bulk pyrite FeS₂ as viewed by in situ and high-resolution X-ray diffraction. *Acta Cryst. B.* **74** (2018). (in press)
4. M. Emigh, **R. D. McAuliffe**, T. Weihs, K. J. Hemker, D. P. Shoemaker, and J. Krogstad. Influence of a nanotwinned, nanocrystalline microstructure on aging of a Ni-25Mo-8Cr superalloy. *Acta Mater.* **156** 411-419 (2018).
3. A. Sethi, T. Byrum, **R. D. McAuliffe**, S. L. Gleason, J. E. Slimak, D. P. Shoemaker, and S. L. Cooper. Magnons and Magnetodielectric Effects in CoCr₂O₄: Raman Scattering Studies. *Phys. Rev. B.* **95** (17) 174413 (2017).
2. **R. D. McAuliffe**, C. A. Miller, X. Zhang, B. S. Hulbert, A. Huq, C. dela Cruz, A. Schleife, D. P. Shoemaker. Structural, electronic, and optical properties of K₂Sn₃O₇ with an offset hollandite structure. *Inorg. Chem.* **56** (5) 2914-2918 (2017).
1. Z. Jiang, S. Tian, S. Lai, **R. D. McAuliffe**, S. P. Rogers, M. Shim, and D. P. Shoemaker. Capturing phase evolution during solvothermal synthesis of metastable Cu₄O₃. *Chem. Mater.* **28** (9) 3080-3089 (2016).

Oral Presentations

- 2018** American Crystallographic Association Conference - Toronto, ON, CA
Hard Materials Seminar - Urbana, IL
- 2017** Pittsburgh Diffraction Conference - Indiana, PA (*invited*)
American Crystallographic Association Conference - New Orleans, LA
American Chemical Society Spring Meeting - San Francisco, CA
- 2016** Hard Materials Seminar - Urbana, IL
- 2015** Hard Materials Seminar - Urbana, IL

Mentoring Experience

- 2018-Present** Charlotte Israel, UIUC Materials Science undergraduate student
Synthesizing new compounds for X-ray and neutron experiments
- 2017-Present** Shuai Li, UIUC Materials Science master's student
Synthesis of new compounds and structure solution using simulated annealing techniques
- 2016** Ben Hulbert, UIUC Materials Science master's student
Synthesis of new compounds for X-ray and neutron experiments
- 2015-2017** Chris Miller, UIUC Materials Science undergraduate student
Synthesis and characterization of K-Sn-O compounds using X-ray diffraction and UV-Vis

Awards and Service

- 2018** American Crystallographic Association Travel Grant
- 2016** Selected for National School on Neutron and X-ray Scattering
- 2015** Selected for Modern Methods in Rietveld Refinement for Structural Analysis school
- 2014** UIUC Physics Van Outreach Member
UIUC Materials Research Society President
- 2013** UIUC Materials Research Society Secretary

Donald Hamer Fellowship (Academic – Materials Science)

2012 Stephen Weinreich Memorial Award (Academic – Physics)

Sigma Pi Sigma – Physics Honor Society

2011 Marquette University Society of Physics Students Vice President

2010 Marquette University Society of Physics Students President

Teaching Experience

Fall 2015 MSE 420: Synthesis of Materials – Grader for Prof. Daniel Shoemaker

Spring 2013 PHYS 2055: Electronics Lab – Teaching assistant for Prof. Ben Brown

Taught weekly lab section for junior-level course. Held office hours and graded assignments.

Fall 2012-Spring 2013 PHYS 1001/2: General Physics 1&2 – Teaching assistant

Taught weekly lab sections, held office hours and graded assignments

Fall 2011-Spring 2013 PHYS 1003/4: General Physics with Introductory Calculus 1&2 – Teaching assistant

Taught weekly lab sections, held office hours and graded assignments

Fall 2010-Spring 2011 PHYS 1013/4: Classical and Modern Physics with Calculus 1&2 – Teaching assistant

Designed lab experiments and led in-class lab sessions. Held office hours and graded assignments.