BETHANY M. HUDAK

Oak Ridge National Laboratory
P.O. Box 2008 MS6071
Oak Ridge, TN, 37831-6071
304.320.8905
hudakbm@ornl.gov
ORCID: 0000-0002-4392-9237

EXPERTISE

- transmission electron microscopy (TEM)
- energy dispersive x-ray spectroscopy (EDS)
- *in situ* S/TEM
- scanning transmission electron microscopy (STEM)
- selected area electron diffraction (SAED)
- technical writing
- electron energy loss spectroscopy (EELS)
- x-ray diffraction (XRD)
- scientific presentations

EDUCATION

July 2016 — **Doctor of Philosophy,** ***University of Kentucky,*** Lexington, KY
Dissertation title: **"Applying Conventional and *In Situ* Transmission Electron Microscopy Techniques to Understand Nanoscale Crystallography"**
Major: **Chemistry**

May 2010 — **Bachelor of Science,** ***Emory & Henry College,*** Emory, VA
Major: **Chemistry**
Minor: **Business Management**
Honors: **Cum Laude**

RESEARCH EXPERIENCE

July 2016-Present — **Post-Doctoral Researcher**, ***Oak Ridge National Laboratory***, Oak Ridge, TN
Mentor: **Dr. Andrew R. Lupini**

- Using aberration-corrected scanning transmission electron microscope (STEM) to study single-atom dopants in silicon

Jan 2016-May 2016 — **Advances Short Term Research Opportunity, *Oak Ridge National Laboratory***
Oak Ridge, TN
Mentor: **Dr. Karren L. More**

- Investigating phase transformation of HfO_2 nanorods using *in situ* heating in a transmission electron microscope

Jan 2011-
July 2016

Doctoral Research, *University of Kentucky*, Lexington, KY
Mentor: **Dr. Beth S. Guiton**

- Studying crystallographic effects of heating on multiple unique nanoscale systems using conventional and *in situ* S/TEM

2008-2009

Undergraduate Senior Research Project, *Emory & Henry College*, Emory, VA
Mentor: **Dr. Laura Hainsworth**

- Conducting research on ethylene production in American Chestnut bark and twig samples using gas chromatography to capture wound-response ethylene readings

TEACHING EXPERIENCE

Spring 2011 & 2012

Physical Chemistry Teaching Assistant, *University of Kentucky*, Lexington, KY
Supervisor: **Dr. Yuguang Cai**

Fall 2011

Analytical Chemistry Teaching Assistant, *University of Kentucky*, Lexington, KY
Supervisor: **Dr. Jason DeRouchey**

Fall 2010

General Chemistry Teaching Assistant, *University of Kentucky*, Lexington, KY
Supervisor: **Dr. Allison Soult**

PUBLICATIONS

[9] L. Yu, R. Han, X. Sang, J. Liu, M. P. Thomas, **B. M. Hudak**, A. Patel, K. Page, and B. S. Guiton; Shell-Induced Ostwald Ripening: Simultaneous Structure, Composition, and Morphology Transformations during the Creation of Hollow Iron Oxide Nanocapsules. *ACS Nano*, August 2018. DOI: 10.1021/acsnano.8b02946

[8] **B. H. Hudak**, J. Song, H. Sims, M. C. Troparevsky, S. T. Pantelides, P. C. Snijders, and A. R. Lupini; Directed atom-by-atom assembly of dopants in silicon. *ACS Nano*. **12**, 5873-5879, (2018).

[7] S. Jesse, **B. M. Hudak***, E. Zarkadoula, J. Song, A. Maksov, M. Fuentes-Cabrera, P. Ganesh, I. Kravchenko, P. C. Snijders, A. R. Lupini, A. Borisevich, and S. V. Kalinin; Direct atomic fabrication and dopant positioning in Si using electron beams with active real time image-based feedback. *Nanotechnology*. **29**, 255303, (2018). *equal contribution

[6] J. Song, **B. M. Hudak**, H. R. Sims, Y. Sharma, T. Z. Ward, S. T. Pantelides, A. R. Lupini, and P. C. Snijders; Homo-endotaxial one-dimensional Si nanostructures. *Nanoscale*. **10**, 260-267, (2017).

[5] **B. M. Hudak**, S. W. Depner, G. R. Waetzig, A. Talapatra, R. Arroyave, S. Banerjee, and B. S. Guiton; Real-time atomistic observation of structural phase transformations in individual hafnia nanorods. *Nature Communications.* **8,** 15316, (2017).

[4] L. Yu, Y. Zhang, **B. M. Hudak**, D. K. Wallace, D. Y. Kim, and B. S. Guiton; Simple synthetic route to manganese-containing nanowires with the spinel crystal structure. *Journal of Solid State Chemistry*. **240**, 23-29, (2016).

[3] J. Mackey, F. Dynys, **B. M. Hudak**, B. S. Guiton, and A. Sehirlioglu; $Co_xNi_{4-x}Sb_{12-y}Sn_y$ Skutterudites: processing and thermoelectric properties.** *Journal of Materials Science*. **51**, 6117-6132, (2016). **STEM data featured on cover.

[2] G. Li, L. Yu, **B. M. Hudak**, Y.-J. Chang, H. Baek, A. Shundararajan, D. R. Strachan, G.-C. Yi, and B. S. Guiton; Direct observation of Li diffusion in Li-doped ZnO nanowires. *Material Research Express.* **3**, 054001, (2016).

[1] **B. M. Hudak**, Y.-J. Chang, L. Yu, G. Li, D. N. Edwards, and B. S. Guiton; Real-time observation of the solid-liquid-vapor dissolution of individual Tin(IV) Oxide nanowires. *ACS Nano.* **8**, 5441-5448, (2014).

PRESENTATIONS

Invited presentations:

[3] **Materials Research Society Meeting, Phoenix, AZ, USA** **2018**
Directed Positioning and Imaging of Single-Atom Dopants for Quantum Computing

[2] **Microscopy & Microanalysis Meeting, Vendor Tutorial, St. Louis, MO, USA** **2017**
Dynamic Nanostructure Phase Transformations Studied Using Aduro Heating Stage in Nion UltraSTEM

[1] **CNMS User Week, Oak Ridge, TN, USA** **2014**
Direct Observation of the Vapor-Liquid-Solid Mechanism in Reverse

Contributed presentations:

[7] **American Physical Society Meeting, Los Angeles, CA, USA** **2018**
Directed Positioning of Subsurface Single-Atom Dopants in Silicon for Quantum Computing

[6] **Oak Ridge Postgraduate Research Symposium, Oak Ridge, TN, USA** **2017**
Direct Atom-by-Atom Assembly of Dopants in Silicon

[5] **Microscopy & Microanalysis Meeting, St. Louis, MO, USA** **2017**
Movement and Imaging of Single-Atom Dopants in Silicon

[4] **American Vacuum Society Meeting, Nashville, TN, USA** **2016**

Direct Observation of the Growth and Dissolution Process of SnO_2 Nanowires

[3] **CNMS User Week, Oak Ridge, TN, USA** **2015**
Direct Observation of Structural Phase Transformations in Individual Hafnia Nanorods

[2] **Microscopy & Microanalysis Meeting, Portland, OR, USA** **2015**
Understanding Nanomaterial Synthesis with In situ Transmission Electron Microscopy

[1] **Materials Research Society Meeting, Boston, MA, USA** **2013**
Direct Observation of the Vapor-Liquid-Solid Mechanism in Reverse

Poster presentations:

[9] **Microscopy & Microanalysis Meeting, St. Louis, MO USA** **2017**
Direct Observation of Hafnia Structural Phase Transformation

[8] **Enhanced Data Generated by Electrons Meeting, Okinawa, Japan** **2017**
EELS analysis of bonding in quantum computing materials

[7] **Materials Research Society Meeting, Boston, MA USA** **2015**
Direct Observation of Structural Phase Transformations in Individual Hafnia Nanorods

[6] **CNMS User Week, Oak Ridge, TN USA** **2015**
Direct Observation of Structural Phase Transformations in Individual Hafnia Nanorods

[5] **University of Kentucky Postdoctoral Symposium, Lexington, KY USA** **2015**
Direct Observation of Structural Phase Transformations in Individual Hafnia Nanorods

[4] **North American Solid State Chemistry Conference, Tallahassee, FL USA** **2015**
Direct Observation of Structural Phase Transformations in Individual Hafnia Nanorods

[3] **Appalachian Regional Microscopy Society Meeting, Oak Ridge, TN USA** **2014**
Real-time Observation of the Solid-Liquid-Vapor Dissolution of SnO_2 Nanowires

[2] **ORNL Committee for Women Annual Poster Event 2014, Oak Ridge National Laboratory, Oak Ridge, TN USA** **2014**
Real-time Observation of the Solid-Liquid-Vapor Dissolution of SnO_2 Nanowires

[1] **Solid State Chemistry Gordon Research Conference, New London, NH USA** **2014**
Real-time Observation of the Solid-Liquid-Vapor Dissolution of SnO_2 Nanowires

FELLOWSHIPS/AWARDS

2017	**Significant Event Award**	Oak Ridge National Laboratory
2017	**Supplemental Performance Award**	Oak Ridge National Laboratory
2016	**Advanced Short-Term Research Opportunity (ASTRO)**	Oak Ridge National Laboratory
2015	**UK-SOPS Postdoctoral Symposium Poster Competition Second Prize**	University of Kentucky
2013	**NASA KY Graduate Fellowship**	University of Kentucky
2013	**Center for Advances Materials Research Assistantship**	University of Kentucky
2012	**KY NSF EPSCoR Research Scholars Program**	University of Kentucky
2010	**Kentucky Excellence Fellowship**	University of Kentucky
2010	**Littleton Chemistry Award**	Emory & Henry College

SYNERGISTIC ACTIVITIES

Volunteer & Outreach, Activities include work with the Tennessee Science Bowl, participation in the ORNL Physical Sciences Directorate Science Fair trailer, Young-Williams Animal Center in Knoxville, TN, and Rhythm N' Blooms Music Festival in Knoxville, TN.

Workshop, One of 66 participants selected from the United States and Canada to participate in the two-week National School on Neutron and X-Ray Scattering (NXS) hosted by Argonne National Laboratory and Oak Ridge National Laboratory, funded by Department of Energy and National Science Foundation Experimental Program to Stimulate Competitive Research (EPSCoR), August 2013.

REFERENCES

Dr. Andrew R. Lupini
Electron Microscopy (STEM)
Oak Ridge National Laboratory
PO Box 2008
Oak Ridge, TN 37831 USA
865-387-0288
arl1000@ornl.gov

Dr. Beth S. Guiton
Inorganic Chemistry
University of Kentucky
105 Chemistry-Physics Building
Lexington, KY 40506 USA
859-257-4215
beth.guiton@uky.edu

Dr. Matthew Chisholm
Electron Microscopy (STEM)
Oak Ridge National Laboratory
PO Box 2008
Oak Ridge, TN 37831 USA
865-574-7333
chisholmmf@ornl.gov