

Education

University of Tennessee at Knoxville

PhD in Materials Science and Engineering (August 2023)

MS in Materials Science and Engineering (Dec 2020)

University of Illinois at Urbana-Champaign

BS in Materials Science and Engineering, Minor in Chemistry (May 2016)

Graduate Research Experience

August 2018 – PhD Student in Materials Science and Engineering

August 2023 Doctoral Advisor: Prof. Bin Hu

Semiconductor materials development of broadband sensing and imaging devices IR to gamma-ray.

Structure-property guided research involving materials synthesis including bulk single crystal growth, thin film processing, and ultrafast laser spectroscopy metrology development with *in-situ* magnetic and electronic capabilities.

February 2022 – DOE Graduate Student Intern at Oak Ridge National Laboratory

December 2022 Host Scientists Dr. Kyle Kelley and Prof. Sergei Kalinin

Discovery of ferroelectric semiconductors through the correlation of functionalized nanometric microscopy (AFM, PFM, SEM-cathodoluminescence, micro-Raman spectroscopy) and python-based data visualization.

Professional Experience

April 2016 – Xerion Advanced Battery Corp. & Xerion Advanced Polymer Corp.

July 2018 Materials Engineer

Team lead of StructurePore™ 3D microporous anode development, involving scale-up from lab to pilot testing.

Synthesis and chemical functionalization of high-performance polymers for solid-state ionic conduction.

Undergraduate Research Experience

May 2014 – *In situ* Ultrafast IR Spectroscopy of Lithium-Ion Battery SEI Layer Formation

May 2016 Advisor: Prof. Dana D. Klott

January 2016 – Design and Development of Liquid Flow Cell for Light-Active Suspensions

June 2016 Advisor: Prof. Renske van der Veen

Materials Science Skills

Experimentation: Ultrafast laser spectroscopy (transient absorption, time-/polarization-resolved fluorescence), Nanometric spectroscopy (PFM, Raman, SEM w/ CL and EDS), voltage spectroscopy (IV, CV, EIS), Material Analysis (FTIR, DMA, TGA, DSC, XRD, rheology)

Materials Synthesis & Processing: Thin Films (PVD, spin-coating, electro-plating), Bulk (single crystal growth, metal sintering), Patterning (wet etching, laser ablation),

Analytical Tools: OriginPro, Python data visualization, CrystalMaker, LaTeX, ImageJ

Honors and Awards

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| Volunteer of Distinction Honoree – UT Office of the Provost and Senior Vice Chancellor | 2023 |
| Best Student Poster Award – Center for Nanophase Materials Science User Meeting | 2023 |
| Graduate Student Poster Contest Winner – American Association for Crystal Growth Southeast | 2023 |
| DOE Office of Science Graduate Research Program (SCGSR) Fellow – Oak Ridge National Lab. | 2021 |
| Best Student Presentation Award – Joint Nanoscience and Neutron Scattering User Meeting | 2021 |
| Excellence in Service Award – UT Material Science and Eng. Department | 2020 |
| Student Mentorship and Research Training Fellowship – Tennessee Science Alliance | 2019 |
| Graduate Student Fellowship – UT Material Science and Eng. Department | 2018 |

Service Positions

August 2019 –2020 President – Materials Research Society UT-Knoxville University Chapter

MRS Special Project Grant Award: “Nerds to Common Words”, Organizer of science communication workshop

August 2020-2022 Secretary – Materials Research Society UT-Knoxville University Chapter

MRS Special Project Grant Award: “Science as Art Exhibit”, Organizer of a UTK PhD researchers scientific art portfolio

Teaching Assistant Positions

Graduate-level Courses:

MSE 514 – Magnetic, Optical, and Electronic Properties of Materials: Fall 2019

MSE 572 – Structural Characterization of Materials: Fall 2018

Undergraduate-level Courses:

MSE 305 – Principals of Materials Laboratory I&II: Fall 2021, Spring 2022, Fall 2022, Spring 2023

MSE 350 – Electronic Materials: Spring 2019, Spring 2020

Oral Presentations

1. Bogdan Dryzhakov, (2023, August). *Heterostructured Ferroelectricity with Light-Emitting Properties by Intracrystalline Mixing of 2D- and 3D- Perovskite Phases*. Contributed Talk, 2023 Center for Nanophase Materials Science User Meeting, Knoxville, TN.
2. Bogdan Dryzhakov. (2023, March). *Single Cells with Tandem Power*. Student PITCHES, ARPA-E, National Harbor, MD.
3. Bogdan Dryzhakov. (2022, May). *Investigating Excited State Coherence and Coupling in Engineered Spin-Cast Superlattices of 2D Halide Perovskites*. Materials Research Society Spring Meeting, Honolulu, HI.
4. Bogdan Dryzhakov. (2021, August). *Optically Induced Static Magnetization in Metal Halide Perovskite for Spin-Related Optoelectronics*. Joint Nanoscience and Neutron Scattering User Meeting, Oak Ridge National Laboratory, TN.

Publications

1. **Dryzhakov, B.**; Lawrie, B. J.; Celio, J. Z.; Wang, M.; Koehler, M.; Hu, B. Dual Emission Bands of a 2D Perovskite Single Crystal with Charge Transfer State Characteristics. *ACS nano* 2023.
2. Tsai, H.; Ghosh, D.; Kinigstein, E.; **Dryzhakov, B.**; Driscoll, H.; Owczarek, M.; Hu, B.; Zhang, X.; Tretiak, S.; Nie, W. Light-Induced Structural Dynamics and Charge Transport in Layered Halide Perovskite Thin Films. *Nano Letters* 2023, 23 (2), 429-436.

3. Tan, R.; **Dryzhakov, B.**; Higgins, K.; Charest, J.; Dancoes, Z.; Kandlakunta, P.; Cao, L. R.; Ahmadi, M.; Hu, B.; Lukosi, E. Lithium Chloride-Substituted Methylammonium Lead Tribromide Perovskites for Dual γ /Neutron Sensing. *ACS Applied Materials & Interfaces* 2022, 14 (30), 34571-34582.
4. Tan, R.; Charest, J.; **Dryzhakov, B.**; Busch, C.; Drouet, L.; Hu, B.; Ahmadi, M.; Lukosi, E. Characterization of solution grown 3D polycrystalline methylammonium lead tribromide for x-ray detection. *Journal of Applied Physics* 2022, 132 (20).
5. Dou, Y.; Demangeat, C.; Wang, M.; **Dryzhakov, B.**; Lee, K. S.; Attias, A. J.; Hu, B. Photophysics and Spin-Physics Studies on Persistent Upconversion Luminescence from Nonlinearly Polarizable Ferroelectric-Like Lattice Prepared by Orderly Packing Donor–Acceptor Structures under Multiphoton Excitation. *Advanced Optical Materials* 2022, 10 (5), 2102002.
6. Kim, D.; **Dryzhakov, B.**; Liu, Y.; Ovchinnikova, O. S.; Hu, B.; Kalinin, S. V.; Ahmadi, M. Ferroelectric and charge transport properties in strain-engineered two-dimensional lead iodide perovskites. *Chemistry of Materials* 2021, 33 (11), 4077-4088.
7. Musiienko, A.; Cizek, J.; Elhadidy, H.; Praus, P.; Higgins, K.; **Dryzhakov, B.**; Kanak, A.; Sureau, F.; Pipek, J.; Belas, E. Origin of defects and positron annihilation in hybrid and all-inorganic perovskites. *Chemistry of Materials* 2021, 34 (1), 297-306.
8. Tan, R.; **Dryzhakov, B.**; Charest, J.; Hu, B.; Ahmadi, M.; Lukosi, E. Improved radiation sensing with methylammonium lead tribromide perovskite semiconductors. *Nuclear Instruments and Methods in Physics Research Section A: Accelerators, Spectrometers, Detectors and Associated Equipment* 2021, 986, 164710.
9. Dou, Y.; Demangeat, C.; Wang, M.; Xu, H.; **Dryzhakov, B.**; Kim, E.; Le Bahers, T.; Lee, K.-S.; Attias, A.-J.; Hu, B. Spin-orbital coupling and slow phonon effects enabled persistent photoluminescence in organic crystal under isomer doping. *Nature communications* 2021, 12 (1), 3485.
10. Musiienko, A.; Pipek, J.; Praus, P.; Brynza, M.; Belas, E.; **Dryzhakov, B.**; Du, M.-H.; Ahmadi, M.; Grill, R. Deciphering the effect of traps on electronic charge transport properties of methylammonium lead tribromide perovskite. *Science advances* 2020, 6 (37), eabb6393.
11. Rutstrom, D.; Stand, L.; **Dryzhakov, B.**; Koschan, M.; Melcher, C. L.; Zhuravleva, M. Crystal growth and scintillation properties of new ytterbium-activated scintillators Cs₄CaI₆: Yb and Cs₄SrI₆: Yb. *Optical Materials* 2020, 110, 110536.
12. Tisdale, J. T.; Musicó, B.; **Dryzhakov, B.**; Koehler, M.; Mandrus, D.; Keppens, V.; Hu, B. Optomechanical Effects Occurring in a Hybrid Metal–Halide Perovskite Single Crystal Based on Photoinduced Resonant Ultrasound Spectroscopy. *The Journal of Physical Chemistry Letters* 2020, 11 (14), 5407-5411.
13. Wang, M.; Shin, H. S.; Zhou, F.; Xu, H.; Prabhakaran, P.; **Dryzhakov, B.**; Su, H.; Lee, K.-S.; Hu, B. Identifying different spin mixing channels occurring in charge-transfer states. *The Journal of Physical Chemistry C* 2020, 124 (27), 14832-14837.
14. Nicolau, B. G.; García-Rey, N.; **Dryzhakov, B.**; Dlott, D. D. Interfacial processes of a model lithium ion battery anode observed, in situ, with vibrational sum-frequency generation spectroscopy. *The Journal of Physical Chemistry C* 2015, 119 (19), 10227-10233.