

# Eric Welch

## Curriculum Vitae

Prairie View A&M Department of Physics  
Office: E. E. O'Banion Science Building 330M  
Phone: 936-261-3143  
[ewwelch@pvamu.edu](mailto:ewwelch@pvamu.edu)

### Education:

- 2019 PhD, Department of Material Science, Engineering and Commercialization, Texas State University  
*Dissertation Title: First principle modeling of hybrid halide perovskites for optoelectronic applications*  
*Dissertation Advisor: Prof. Alex Zakhidov*
- 2016 MSc, Department of Physics, Texas State University  
*Thesis title: Characteristics of the Bose glass phase in disordered optical lattices*  
*Thesis Advisor: Prof. Byoungyak Lee*
- 2014 BSc, Department of Physics, Texas State University
- 2010 BSc, Department of Criminal Justice, Sam Houston State University

### Employment History:

- 2022 - Assistant Professor, Department of Physics, Prairie View A&M
- 2022 - 2023 Adjunct Graduate Faculty Member, Department of Physics, Texas State University (**Physics MS committee member**)
- 2021 - 2022 Postdoctoral Research Assistant, Dr. Luisa Scolfaro, Department of Physics, Texas State University (**Material modeling of III-V, III-Oxide and alloy optoelectronic properties, VASP, python, linux**)
- 2021 Staff scientist, Dr. Alex Zakhidov, Department of Physics, Texas State University
- 2020 Postdoctoral Research Assistant, Dr. Shane Yost, Department of Chemistry and Biochemistry, Texas State University (**Benchmark QChem methods for charge transport in small and medium organic molecules, python, linux**)
- 2015 – 2019 Graduate Research Assistant, Dr. Alex Zakhidov, Department of Material Science, Engineering and Commercialization, Texas State University (**Material modeling of halide perovskite optoelectronic properties, VASP, python, linux**)
- 2017 Researcher, Dr. Alex Zakhidov and Dr. Alex Kuznetsov, Department of Physics, Texas State University and KLA Tencor Collaborative research project
- 2014 – 2015 Graduate Research Assistant, Dr. Byoungyak Lee and Dr. Luisa Scolfaro, Department of Physics, Texas State University (**Studied superfluid phase changes from first principles, MatLab**)
- 2014 Undergraduate Research Assistant, Dr. Craig Swartz, Department of Physics, Texas State University (**Modeled transport equations in PbTe, MatLab**)
- 2012 – 2014 Undergraduate Research Assistant, Dr. Byoungyak Lee, Department of Physics, Texas State University
- 2012 – 2014 Undergraduate Research Assistant, Dr. Karol Lang, Department of Physics and Astronomy, The University of Texas



**Grants**

2022	Rise Undergraduate research grant (funded)
2023	Rapid Rise summer research grant (funded)
2023	[Under review] NSF HBCU-EiR grant

**Publications**

1. Computational study and ion diffusion analyses of native defects and indium alloying in  $\beta$ -Ga<sub>2</sub>O<sub>3</sub> structures. Nathan Rabelo Martins, Luiz Augusto Ferreira de Campos Viana, Alan Antonio das Gracias Santos, Daiane Damasceno Borges, **Eric Welch**, Pablo Damasceno Borges, Luisa Scolfaro, (2024).
2. Indium defect complexes in (In<sub>x</sub>Ga<sub>1-x</sub>)<sub>2</sub>O<sub>3</sub>: A combined experimental and hybrid density functional theory study. **Eric Welch**, Md Abdul Ahad Talukder, Nathan Rabelo Martins, Pablo Damasceno Borges, Ravi Droopad, Luisa Scolfaro, Journal of Physics D: Applied Physics, (2024).
3. Hybrid density functional theory study of substitutional Gd in  $\beta$ -Ga<sub>2</sub>O<sub>2</sub>. **Eric Welch**, Pablo Borges, Luisa Scolfaro, Physica B: Condensed Matter, 651, 414558 (2023).
4. Opto-electronic properties of Carbon doped NiO. Sam Cantrell, **Eric Welch**, Luisa Scolfaro, Wilhelm Geerts, Journal of Physics and Chemistry of Solids, 174, 111110 (2023).
5. Hybrid density functional theory study on zinc blende GaN and diamond surfaces and interfaces: Effects of size, hydrogen passivation and dipole corrections. **Eric Welch**, Luisa Scolfaro, Computational Condensed Matter 30, e00653 (2022).
6. A density functional theory study on interface stability between CsPbBr<sub>3</sub> and CuI. **Eric Welch**, Young-Kwang Jung, Luisa Scolfaro, Aron Walsh, Alex Zakhidov, AIP Advances 10, 085023 (2020).
7. Polarons in halide perovskites. Dibyajyoti Gosh, **Eric Welch**, Amanda Neukirch, Alex Zakhidov, Sergei Tretiak, J. Phys. Chem. Lett. 11, 9 (2020)
  - a. Cover art, J. Phys. Chem. Lett. Vol. 11 Issue 9.
8. Ultrafast polarization control of zero-bias photocurrent and terahertz emission in hybrid organic perovskites. Petr Obraztsov, Dmitry Lyashenko, Pavel Chizhov, Kuniaki Konishi, Natsuki Nemoto, Makoto Kuwata-Gonokami, **Eric Welch** and Alexander Obraztsov, Nature Communication Physics 1, 14 (2018).
9. Density functional theory +U modeling of polarons in organohalide lead perovskites. **Eric Welch**, Alex Zakhidov, Luisa Scolfaro, AIP Advances 6, 125037, (2016).
10. The effect of anisotropic valleys on phonon scattering and the magnetotransport properties of n-type PbTe. C.S. Swartz, J.E. Petersen, **E.W. Welch**, T.H. Meyers, Journal of Electronic Materials 45, 1 (2016).

**Fellowships and Scholarships:**

2014	Dr. James R Crawford Scholarship for undergraduate excellence
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**Awards:**

2020	Outstanding Dissertation Award
2018	Business bootcamp (MSEC) II winner (\$10,000 award towards tech start-up)
2017	Business bootcamp (MSEC) I winner (\$500 award)
2016	Texas Section APS Best Poster Award
2015	Graduate Award for academic excellence

2015 Graduate Lab Instructor award for teaching excellence

**Presentations**

- 2023 APS Meeting (Las Vegas, NV) – Poster  
Session G00: Poster Session 1  
Modeling rare earth metal alloying in wide band gap oxides
- 2021 Texas Sectional APS Meeting (virtual) – Oral Presentation  
Session D05: APS: Condensed Matter and Plasma Physics I  
First principle Hybrid Density Functional Theory Study of Halide Perovskite Surfaces and Interfaces
- 2019 MRS Meeting (Boston, MA) – Poster  
Session EN09.06.24: Advances in the fundamental science of halide perovskite optoelectronics  
First principle modeling of CsPbBr<sub>3</sub>-CuI interfaces for light emitting applications
- 2018 MRS Meeting (Boston, MA) – Poster  
Session ET05.03.08: Energy – Transfer, Storage and Conversion  
First Principle Polaron Modeling in Hybrid Perovskites Using the GGA+U Method
- 2018 Texas Sectional APS Meeting (Houston, TX) – Poster  
Session G: Poster Session  
First Principle Polaron Modeling in Hybrid Perovskites Using the GGA+U Method
- 2018 Tenth International Research Conference for Graduate Students (San Marcos, TX) - Poster  
First Principle Polaron Modeling in Hybrid Perovskites Using the GGA+U Method
- 2017 Texas Sectional APS Meeting (San Antonio, TX) – Oral Presentation  
Session C2: Condensed Matter  
Rashba splitting, spin orbit corrections and their implications in organolead halide perovskites
- 2016 APS Meeting (Baltimore, MD) – Poster  
Session M1: Poster Session II  
DFT and DFT+U Calculations of Lead Halide Perovskites Modeling Polaron Behavior and Doping
- 2015 Seventh International Research Conference for Graduate Students (San Marcos, TX) – Poster  
DFT and DFT+U Calculations of Lead Halide Perovskites Modeling Polaron Behavior and Doping
- 2015 Texas Sectional APS Meeting (Waco, TX) – Poster Presentation  
Session N2: Condensed Matter Physics II  
DFT and DFT+U Calculations of Lead Halide Perovskites Modeling Polaron Behavior and Doping
- 2015 APS Meeting (San Antonio, TX) – Oral Presentation  
Session Q35: Many Body Localization and Disordered Optical Lattices

**Teaching Experience:**

- 2023 Summer REU Mentor, Math and Science REU, Prairie View A&M University
- 2022 - Assistant professor of physics, Department of Physics and Chemistry, Prairie View A&M University
- 2021 Guest lecturer in graduate solid state physics course, Department of Physics, Texas State University
- 2018 – 2020 Guest lecturer in graduate quantum mechanics course, Department of Physics, Texas State University
- 2013 – 2017 Lab instructor Department of Physics, Texas State University
- 2014 Math and physics tutor in the student support services center for student with disabilities, Texas State University
- 2013 – 2014 Lead math and physics tutor in the student learning assistance center (largest tutoring center on campus), Texas State University

**Courses Taught:**

- Undergraduate calculus-based university physics 1 and 2
- Undergraduate mechanics 1
- Graduate solid-state physics (hands-on DFT calculations, guest lecturer)
- Graduate quantum mechanics (special topic on density functional theory, guest lecturer)
- Mechanics, electricity and magnetism, and heat and waves labs

**Professional Development:**

- Project manager course, Department of Material Science, Engineering and Commercialization, Texas State University
- U-Rise Mentor training, STEM Departments, Texas State University

**Professional Membership:**

- Pi Sigma Pi National Honor Society
- American Physical Society
- Material Research Society

**Software Proficiency/experience:**

- Python (numpy, scipy, pandas, os, pymatgen, matplotlib), Matlab, Linux environments, bash scripting, slurm interface (HPC)
- MS Office (Word, Excel, Powerpoint, Project)
- VASP (Vienna Ab-Initio Simulation Package), VESTA

**Recommenders:**

- Dr. Kevin Storr, 700 University Dr., Prairie View, TX, [ksstorr@pvamu.edu](mailto:ksstorr@pvamu.edu)
- Dr. Luisa Scolfaro, 601 University Dr., San Marcos, TX, [lscolfaro@txstate.edu](mailto:lscolfaro@txstate.edu)
- Dr. Todd Hudnall, 601 University Dr., San Marcos, TX, [hudnall@txstate.edu](mailto:hudnall@txstate.edu)
- Dr. Mark Wistey, 601 University Dr., San Marcos, TX, [mwistey@txstate.edu](mailto:mwistey@txstate.edu)

**Personal Links:**

- <https://github.com/ericwwelch314>
- <https://speakerdeck.com/ericwwelch314>