

# Genesis Mariana Higueros

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## Profile

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- Investigating radiative thermal management wearables and **bio-inspired batteries** by fundamental theorem analysis and nanofabrication methods
- Experienced in **microfabrication** technology including photolithography and reactive ion etching (RIE)
- Academic teaching in **thermodynamics and electrochemistry courses** for undergraduate and graduate students
- Organized several **diversity initiatives and outreach** events including Light, Infrared, and Thermal Energy workshop for high school students of underrepresented backgrounds

## Education

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### 2019-Present

Expected graduation: May 2025

Cumulative GPA: 3.45/4.00

Advisor: Prof. Po-Chun Hsu

Duke University

Ph.D. in Mechanical Engineering & Materials Science

### 2015-2019

Cumulative GPA: 3.89/4.00

University of California, Merced

Bachelor of Science in Environmental Engineering

## Publications

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(\*corresponding author, †equal contribution)

**G. Higueros**, C. Sui, R. Wu, P.-J. Hung, P.-C. Hsu\* “Synthesis of Ultra-thin, Ultra-long Silver Nanowires by Imprint Method” (2025) *In progress*

**G. Higueros**, Q. Li, P.-C. Hsu\* “Perspective on the Next Ten Years of Wearable Passive Radiative Thermoregulation” *ACS Materials Letters* (2025) *In progress*

P.-J. Hung, Q. Li, T.-H. Chen, C.-T. Fu, Y. Han, R. Wu, G. Yan, Q. Fan, J. Liu, P.-R. Huang, Y. Chen, C. Sui, **G. Higueros**, A. Flores, F. Shi, P.-C. Hsu\* “An All-Solution-Processed Mid-IR Electrochromic (ASPIRE) Device” (2025) *In progress*

R. Wu, Y. Xi, G. Yan, E. Luo, Q. Li, Y. Chen, Y. Han, **G. Higueros**, A. Ruthen, C. Sui, A. Suresh, D. Mitzi, C. Liu, P.-C. Hsu\* “Distributed direct air capture by carbon nanofiber air filters” (2025) *In progress*

J. Liang, C. Sui, J. Tian, **G. Higueros**, T.-H. Chen, R. Wu, P.-J. Hung, Y. Deng, N. Rozman, W. J. Padilla, P.-C. Hsu\* “Ionic Liquid-based Reversible Metal Electrodeposition for Adaptive Radiative Thermoregulation under Extreme Environments” *Advanced Functional Materials* (2024) *In review*

**G. Higueros**†, K. Wang†, C. Sui, P.-C. Hsu\* “Solution-Processed Metallic Nanowire Network for Wearable Transparent Thermal Radiation Shield” *ACS Nano* (2024) DOI: 10.1021/acsnano.4c02093

C. Sui, Z. Jiang, **G. Higueros**, D. Carlson, P.-C. Hsu\* “Designing electrodes and electrolytes for batteries by leveraging deep learning” *Nano Research Energy* (2023) DOI: 10.26599/NRE.2023.9120102

C. Sui†, Y.-Y. Li†, X. Li, **G. Higueros**, K. Wang, W. Xie, P.-C. Hsu\* “Bio-inspired computational design of vascularized electrodes for high-performance fast-charging batteries optimized by deep learning” *Advanced Energy Materials* (2022) DOI: 10.1002/aenm.202103044

## Technical Experience

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### University of Chicago

#### March 2023 – Present      *Hsu Group/ Wearable Transparent Thermal Radiation Shield*

- Designed experimental protocols and fabricated transparent radiation shield specimens
- Characterized visible transmittance and mid-infrared reflectance of single-layered AgNWs networks

#### Jun 2021 – Jul 2022      *MOF-199 for Carbon Dioxide Direct Air Capture (DAC)*

- Responsible for synthesis of metal organic framework, HKUST, filter for low pressure direct air capture
- Filter designed for decentralization of carbon dioxide sequestration

### Duke University

#### Jun 2019 – March 2023      *Hsu Group/Vascular ENabled Advanced (VENA) Batteries*

- Fabricating dual-porous graphite anodes for fast-charging, high-energy density batteries by increased materials utilization and lowered ionic tortuosity
- A cleanroom fabrication process could produce sacrificial 2D micro-sized templates. Magnetic alignment for orientation purposes and CAD designs permits a myriad of possible 2D structures
- Our approach for vascularized channels in electrodes may be applied to various energy systems

#### Jul 2020 – Jun 2021      *Hsu Group/X-ray CT Battery Thermal Measurement*

- Assembled several Li-ion battery coin (CR2032) and cylindrical (18650) cells with resistant temperature detectors to predict battery thermal gradients using x-ray computed tomography in collaboration with Dr. Cristian Badea and group

### University of California, San Diego

#### Jun 2018 – Aug 2018      *Summer Undergraduate Research Fellowship/Supercapacitors*

- Drop casted PEDOT:PSS and N2200 polymers onto electrodes for Type IV supercapacitors with Dr. Tse Nga Ng and characterized system utilizing three-electrode electrochemical cells and EC-Lab software

### University of California, Merced

#### Jun 2017 – Aug 2017      *Summer Undergraduate Research Fellowship/Plasma Gasification*

- Researched effects of biochar steam activation and its resultant surface properties with Dr. Gerardo Diaz
- Operated gas chromatograph and PeakSimple software to analyze producer gas of activated peach pits

## Awards and Fellowships

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2019-Present	Alfred P. Sloan Foundation Scholarship, Duke University
2019	Outstanding Student Award for Environmental Engineering, University of California, Merced
2017-19	Summer Undergraduate Research Fellowship, University of California, Merced
2015	Project Recognition Award, The American Association of University Women

## Verbal & Poster Presentations

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- Poster “*Solution-Processed Metallic Nanowire Network for Wearable Thermal Transparent Radiation Shield*” MRS 2024 Spring Meeting, Seattle, CA, Tuesday April 23, 2024
  - **Best Poster Award** for the symposium *Plasmonics and Metasurfaces: Design, Materials, and Applications* (EL08)
- Virtual Presentation “*Vascular ENabled Advanced (VENA) Electrodes for Fast Charging LIBs*” NC Space Symposium, NC, April 8, 2022
- Virtual Presentation “*Vascular ENabled Advanced (VENA) Electrodes for Fast Charging LIBs*” 9<sup>th</sup> Annual Triangle Student Research Competition, Raleigh, NC, October 7, 2021

- Presentation “*Dual-porosity Electrodes for Fast-Charging Li-ion Batteries*” Energy Materials Seminar, Durham, NC, January 10, 2020
- Poster “*Fabrication and Characterization of Polymers for Type IV Supercapacitors*” SHPE 2018 National Convention, Cleveland, OH, November 9, 2018
- Presentation “*Fabrication and Characterization of Polymers for Type IV Supercapacitors*” Summer Research Conference at UC San Diego, San Diego, CA, August 16, 2018
- Poster “*High Temperature Steam Activation of Peach Pit Biochar*” 2017 SACNAS International Conference, Salt Lake City, UT, October 20, 2017
- Presentation and Poster “*High Temperature Steam Activation of Peach Pit Biochar*” 2017 Annual Summer Undergraduate Research Symposium at UC Merced, Merced, CA, August 4, 2017

## Teaching & Mentoring Experience

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- **Lead organizer of Light, Infrared, and Thermal Energy (LITE) demo (UChicago)** for the annual South Side Science Festival, a one-day outreach event hosted for local community students, 2023, 2024
- **Spring 2022 – Electrochemistry in Energy Applications (Duke)**. Teaching assistant responsible for homework grading. Office hours were held twice in the semester.
- **Fall 2021 – Heat and Mass Transfer (Duke)**. One out of five teaching assistants for a 70-student class. Responsible for grading homework assignments.
- **Spring 2021 – Thermodynamics (Duke)**. Teaching assistant for approx. 40 undergraduate students. Responsible for grading homeworks and laboratory assignments as well as office hours.
- Lead organizer for **Light, Infrared, and Thermal Energy (LITE) Workshop**, a one-day outreach event for highschool students from underrepresented backgrounds in STEM. Managed volunteers, created lectures, and designed/implemented virtual-reality thermal-imaging headsets, 2022
- Moderated MRS@Duke **Implicit Bias Workshop** in collaboration with the University Program in Materials Science and Engineering and the Duke Office for Institutional Equity to promote discussion of racial biases and microaggressions in classrooms to prevent intolerance and foster community, 2020
- **Graduate student mentor** for first-year graduate students in the Mentorship Network Program at Duke University, 2020
- **Hosted STEM-based workshops** in collaboration with the Society of Women Engineers for Expand Your Horizons conference which aims to empower young female students, 2016, 2018, 2019

## Skills

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### Software

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|-----------------------|-----------|----------------|
| • EC-Lab              | • COMSOL  | • GasLab       |
| • AutoCAD             | • Fortran | • PeakSimple   |
| • Autodesk Fusion 360 | • Matlab  | • LayoutEditor |
| • Crystal Maker       | • ImageJ  | • PreForm      |
| • OpenLCA             | • Origin  | • Audacity     |

### Technical

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|------------------------------------|---|
| • Scanning Electron Microscope     | • Reactive ion etching                          |
| • Transmission Electron Microscope | • Inductively coupled plasma etching            |
| • X-Ray Photoelectron Spectroscopy | • Metal thermal evaporation                     |
| • X-Ray Diffraction                | • High-density plasma chemical vapor deposition |
| • Gas chromatography               | • Photolithography                              |
| • Atomic layer deposition          | • Confocal Raman microscopy                     |
|                                    | • Electron Energy Loss Spectroscopy             |

## Extracurricular Activities

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**Jun 2020 – Jul 2022**

**Materials Research Society at Duke University (MRS@DUKE)**

- Acted as the 2021-2022 President responsible for overseeing club activities, events, and Executive Board
- Outreach Coordinator from 2020-2021 responsible for undergraduate and graduate outreach events, local community engagement, and membership retainment
- Managed advertisement of events and designed all flyers
- Assisted President with his duties on managing executive board and regularly provided advice as a past student organization President

**Aug 2017 – Apr 2019**

**Solar Energy Association at UC Merced**

- President from 2018-2019 and responsible for overseeing executive board, general meetings and events
- Vice President from 2017-2018 and assisted President with her duties
- Managed the Solar Charging Station Project from January to May 2018
- Provided key lectures on solar panels and power calculations

## References

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### **Dr. Po-Chun Hsu**

Assistant Professor, Pritzker School of Molecular Engineering, University of Chicago

Assistant Professor, Thomas Lord Department of Mechanical Engineering and Materials Science, Duke University

*pochunhsu@uchicago.edu*

### **Dr. Adrian Bejan**

J.A. Jones Distinguished Professor of Mechanical Engineering, Thomas Lord Department of Mechanical Engineering and Materials Science, Duke University

*abejan@duke.edu*

### **Dr. Adrienne Stiff-Roberts**

Associate Dean for Community Based Innovation in the Pratt School of Engineering, Duke University

Jeffrey N. Vinik Professor of Electrical and Computer Engineering, Department of Electrical and Computer Engineering, Duke University

Professor, Thomas Lord Department of Mechanical Engineering and Materials Science, Duke University

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