

Karla Negrete

Postdoctoral Researcher
Chimie du Solide et de l'Énergie Laboratory (CSE)
Collège de France / Paris, France



EDUCATION

- Ph.D. Mechanical Engineering, Drexel University, 2025
- M.Sc. Mechanical Engineering, University of Maryland Baltimore County, 2021
- B.Sc. Mechanical Engineering, University of Maryland Baltimore County, 2019

RESEARCH AREAS

Developing data-driven methods to study battery degradation by combining electrochemical experiments, data science, and machine learning. Interests include physics-based diagnostics, performance prognostics, probabilistic ML for manufacturing, and non-destructive characterization.

APPOINTMENTS

October 2026 - Collège de France

Presently

- Postdoctoral Researcher, Chimie du Solide et de l'Énergie Laboratory
- Advisor: Professor Jean-Marie Tarascon
- Developing a SQL-based database to organize CSE lab data and enable ML
- Investigating early optical signals as predictors of battery performance

RESEARCH EXPERIENCE

- 2025 Guest Researcher, Argonne National Laboratory, Chemical Sciences and Engineering Division
Advisor: Marco-Tulio Fonseca Rodrigues, Ph.D.
- 2022-25 Ph.D. Researcher, Drexel University
Advisor: Maureen Tang, Ph.D.
Thesis: *Electrochemical Fluorescence Microscopy to Predict Li-ion Battery Performance*
- 2020-22 Graduate Investigator, Johns Hopkins Applied Physics Laboratory
Advisor: Shannon MacKenzie, Ph.D.
Project: *Spectral/compositional library for interpretation of DragonCam/DraGNS measurements*
- 2020 Graduate Intern, Idaho National Laboratory
Advisor: Eric Dufek, Ph.D.
Project: *State-of-health Estimations of LIB Half-cells for Machine-Learning Applications*
- 2017-21 BSc/MSc Researcher, University of Maryland Baltimore County
Advisor: Deepa Madan, Ph.D.
Project: *Development of Mn-based Electrodes and Gel Electrolytes*
- 2018 NSF REU, MD Robotics Center, University of Maryland
Advisor: Hugh Bruck, Ph.D.
Project: *Flapping-Wing Air Vehicle by Pneumatic Soft Actuation Design*

PUBLICATIONS

Journal Articles

- 2026 **K. Negrete**, R. Butler, E. Wallis, E. Magnani, M. B. McGlynn, M. McDonald, N. J. Alvarez, and M. H. Tang. “Preventing Spread of the Invasive Spotted Lanternfly via Texture-Based Automated Egg Detection.” *Frontiers in Insect Science*, 6:1678964 (2026).
- 2025 **K. Negrete**, M.-T. Fonseca Rodrigues, D. P. Abraham, and M. H. Tang. “Forecasting Battery Electrode Performance via Electrochemical Fluorescence Microscopy and Machine Learning.” *ACS Applied Materials & Interfaces*, 17(50), 67906–67913 (2025).
- 2025 E. Baburoglu, **K. Negrete**, M. H. Tang, and N. J. Alvarez. “Measuring Dynamic Gradients in Drying Battery Electrode Coatings via Microscale Resistivity.” *Langmuir*, 41(44), 29976–29984 (2025).
- 2024 **K. Negrete** and M. H. Tang. “Visualizing and Quantifying Electronic Accessibility in Composite Battery Electrodes using Electrochemical Fluorescent Microscopy.” *Journal of the Electrochemical Society*, 171(10), 100512.
- 2021 S. Poosapati, S. Vadnala, **K. Negrete**, D. Madan, M. Thorpe. “Rechargeable Zinc–Electrolytic Manganese Dioxide (EMD) Battery with a Flexible Chitosan Alkaline Electrolyte.” *ACS Applied Energy Materials*.
- 2021 S. Poosapati, **K. Negrete**, D. Madan, M. Thorpe. “Safe and Flexible Chitosan-Based Polymer Gel as an Electrolyte for Use in Zinc-Alkaline Based Chemistries.” *Journal of Applied Polymer Science*.
- 2019 S. Poosapati, **K. Negrete**, N. Jang, L. Hu, Y. Lan, D. Madan. “Wood Cellulose-Based Thin Gel Electrolyte with Enhanced Ionic Conductivity.” *MRS Communications*, 9, 1015–1021.

Patents

- 2025 **K. Negrete**, M. H. Tang, and S. Lee. *Measuring Electronic Accessibility of Electrode Regions and Particles*. U.S. Patent Application US20250354951A1 (published 2025).

CONFERENCE ACTIVITY

Oral Presentations

- 2024 “In-situ Electrochemical Fluorescent Microscopy to Predict Li-Ion Battery Performance.” **K. Negrete** and M. Tang. AIChE Annual Meeting.
- 2024 “Electrochemical Fluorescent Microscopy to Visualize Reaction Distributions in Battery Electrodes.” **K. Negrete** and M. Tang. 245th ECS Meeting.
- 2022 “Composition Library for Interpretation of DragonCam Data of Titan Surface Samples.” **K. Negrete** and S. MacKenzie. AbSciCon 2022.
- 2021 “Eco-efficient Flexible Gel Electrolyte in Safe Zinc Rechargeable Batteries (ZRBS).” **K. Negrete** and D. Madan. SAMPE B/W University Research Symposium; awarded second place.
- 2018 “Puncture Perfect: A Patch Intended to Illuminate Veins Using Thermochromic Ink and the Body’s Natural Temperature Gradient.” **K. Negrete**. First place, UMBC Idea Competition.

Poster Presentations

- 2022 “Visualizing Reaction Distributions for Materials Validation and Failure Analysis in Li-Ion Batteries.” **K. Negrete** and M. Tang. 242nd ECS Meeting.
- 2020 “Safe and Flexible Chitosan Gel Electrolyte-Based Zn–MnO₂ Alkaline Batteries.” **K. Negrete** and D. Madan. PRiME 2020.

- 2020 “Chemical Deposition of MnO₂ onto Pre- and Post-Processed Porous Substrates for Use in Zn-Based Secondary Battery Applications.” **K. Negrete**, A. Poosapati, and D. Madan. 237th ECS Meeting
- 2019 “Wood Cellulose-Based Thin Gel Electrolyte with Enhanced Ionic Conductivity.” **K. Negrete**, A. Poosapati, and D. Madan. UMBC Undergraduate Research Symposium.

GRANTS AND AWARDS

Fellowships

- 2025-26 Semifinalist, Fulbright Program.
- 2024 Koerner Family Foundation Graduate Fellowship.
- 2020 National GEM Consortium Full Fellowship.
- 2019 IMSD Meyerhoff Graduate Fellows Program Fellowship.

Awards and Honors

- 2020 Isella Outdoor “Rocktober Gear Scholarship” First-place essay addressing sociocultural challenges of women climbers.
- 2017-18 UMBC Undergraduate Research Award (URA). Funding supported undergraduate research.
- 2017 UMBC Idea Competition. First place winner.
- 2016 UMBC Hill-Lopes Scholarship.

TEACHING EXPERIENCE

Graduate Teaching Assistantships

- 2024 Drexel University, Intro to Programming for Engineers (300 students)
- Led 2 lab sessions (3x/week) and supported lectures (2x/week)
- 2021 UMBC, Engineering Numerical Methods Lab-section (50 students each)
- Developed 12-week MATLAB lab curriculum. Lectured (2x/week).

Mentorship & Outreach

- 2025 Graduate Research Mentor, Drexel University
- Bridget Heun: Electrochemical fluorescent microscopy (EFM) on cycled graphite anodes
- 2024 Graduate Research Mentor, Drexel University
- Hala Mohamed: Overcharge protocols on NMC materials
- Saturo Eto: Imaging spotted lanternfly eggs
- 2023 Graduate Research Mentor, Drexel University
- Annette Kroes: Blob-detection software development
- 2022 Graduate Research Mentor, Drexel University
- Evelyn Carpenter: Fluorophore characterization
- Xezel Peshlakai: Mini-potentiostat development
- 2022 Volunteer Instructor, Science Leadership Academy
- Designed geothermal energy mini-course for 5th–6th grade students

- 2021 Orientation Advisor, UMBC
 - Advised 30+ incoming engineering freshmen on course planning
- 2020-21 First-Generation Peer Mentor, UMBC
 - Provided weekly academic mentoring and STEM resources
- 2016-18 Writing Tutor, UMBC Writing Center
 - Tutored undergrad to PhD students, specialized in ESL support

SKILLS

Programming: Python, MATLAB, ImageJ, SolidWorks, Git, LaTeX

Electrochemical Analysis: Potentiostat/Galvanostat operation (BioLogic), battery cycling (Arbin), EIS, CV, GITT

Microscopy/Imaging: Electrochemical fluorescence microscopy (EFM), wide-field microscopy (Zeiss), image segmentation (Fiji/ImageJ)

Lab Equipment: Glovebox maintenance (LC Tech), thermal evaporation (Trovato), coin cell assembly, half-cell testing

Languages: English (native), Spanish (native), French (beginner)

MEMBERSHIPS

Drexel Graduate Women in Science and Engineering (DGWISE)

The Electrochemical Society (ECS), Student Member

American Society for Engineering Education (ASEE)

American Alpine Club (AAC)

Updated July 2026