ERICK ESPINOSA VILLATORO

MATERIALS SCIENCE, PH.D.

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RESEARCH INTEREST

- Li-metal, Li-ion and Si anode degradation mechanisms.
- Synchrotron-based diagnostics for fast-charging protocols.
- Ceramic cathodes for Na-ion and Li-ion systems.
- Mechanistic modeling *via* impedance spectroscopy.
- Electrochemical characterization for multiple battery's chemistries.
- Laser Ablation Laser Ionization Time-of-Fligh Mass Spectrometry.
- Material synthesis for CO_2 capture, catalysis and battery applications.

PUBLICATIONS

- Disentangling the Role of Al, Co, and Mn Dopants in LiNiO2 Cathodes via Synchrotron-Based Probes, submitted to Advanced Energy Materials.
- Exploring the capture and catalytic properties of sodium manganates: bifunctional ceramics for CO/CO_2 chemisorption and oxidation, J. of Environmental Management (2026).
- Tracking the evolution of processes occurring in silicon anodes in lithium-ion batteries by 3D visualization of relaxation times, J. Electroanal. Chem. (2021).

LANGUAGES

English: Fluent (technical and conversational)

Spanish: Native

REFERENCES

Johanna Nelson Weker, Ph.D.

650 926 3300 (5565)

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Molleigh B. Preefer, Ph. D.

650 926 3300 (2757)

molleigh@slac.stanford.edu

PROFESSIONAL EXPERIENCE

Postdoctoral Scholar

Stanford Synchrotron Radiation Lightsource (SSRL), SLAC - Menlo Park, CA

2022 - Present

- Led synchrotron-based characterization of Li||NMC and Li||S cells under extreme fast charging protocols using TXM, XRD, and μ-XAS techniques.
- Designed and executed *operando* and *ex-situ* experiments to investigate degradation pathways in cathodes and Si anodes.
- Managed Laser Ablation Laser Ionization Mass Spectrometer (LALI-ToF-MS) for elemental mapping and trace analysis of battery electrodes.
- Assembled and tested coin and pouch cells with varied chemistries and electrolytes for advanced electrochemical diagnostics.
- Collaborated with national labs (ORNL, LBNL, INL, UCLA, APS) to integrate multi-modal data into mechanistic models of battery failure and performance.
- Contributed to DOE-funded projects targeting low-cost, high-energy Li-metal batteries for EV applications.

Postdoctoral Researcher

Institute of Materials Research, UNAM - Mexico City, MX

Nov 2021 - Apr 2022

- Synthesized and characterized $NaMO_2$ ceramics (M = Fe, Mn) for CO/CO_2 adsorption and catalytic oxidation.
- Evaluated electrochemical performance of doped ferrites as cathode materials for Na-ion and Li-ion batteries.
- Applied XRD, SEM, and TGA to optimize synthesis parameters and assess structural stability.
- Explored bifunctional material behavior for energy storage and environmental remediation applications.

EDUCATION

Ph.D. in Materials Science

Institute of Physics , Benemérita Universidad Autónoma de Puebla (BUAP), Puebla, MX

Jan 2017 - Jun 2021

- Dissertation: Effect of Na preconditioning on Si anodes for Li-ion batteries.
- 11-month research stay at SLAC (SSRL), focused on synchrotron characterization of preconditioned Si electrodes.
- Presented findings at ECS, MRS, and SSRL Users' Meetings.

M.SC. in Materials Science

BUAP, Mexico

Aug 2015 - Dec 2016

- 1.5 years to get the degree at the Institute of Physics, BUAP.
- Participation in multiple national scientific conferences (2015 - 2016).
- Teaching experience: chemistry and physics courses (2015).

B. E. in Energy Engineering

Universidad Politécnica de Chiapas

Aug 2011 - Dec 2014

TECHNICAL SKILLS

Category	Tools & Techiniques
Synchrotron Techniques	XRD, TXM, STXM, μ-XRF, μ-XANES, EXAFS, Ptychography
Materials Characterization	XRD, SEM, AFM, XPS, LALI-ToF-MS, Cryo-EM
Electrochemical Analysis	CV, EIS, Galvanostatic cycling, DC modeling
Programming	Python (NumPy, SciPy, Matplotlib, lmfit), MATLAB
Cell Assembly	Coin, pouch, Swagelok formats; glovebox handling
Data Analysis	Origin, Matlab, custom Python workflows