

Somerville, MA 02145
Greater Boston Area
Personal Mobile: +1 650 417 1610
Personal e-mail: erickleoev@gmail.com
Institutional e-mail: erickleo@slac.stanford.edu
ORCID: orcid.org/0000-0002-0489-4158
Digital CV: www.erickev.com
Website: [LinkedIn](#) - Erick Espinosa Villatoro

Erick Espinosa-Villatoro, Ph.D.

EDUCATION

- ◇ **Ph.D. in Materials Science** **01/2017 – 06/2021**
Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
Thesis: Effect of pre-conditioning of Si anodes by sodiation in their performance in Li ion batteries.
CONACyT Scholarship.
Thesis Director: Dr. Enrique Quiroga González
- ◇ **M.Sc. in Materials Science** **08/2015 - 12/2016**
Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
CONACyT Scholarship.
- ◇ **B.E. Energy Engineering** **08/2011 - 12/2014**
Universidad Politécnica de Chiapas, Suchiapa, Chiapas, Mexico.

PROFESSIONAL

- ◇ **Research Scientist** **10/2026 - Present**
Mesostructured Materials and Devices Lab, Boston University
Lead the development, custom fabrication, and packaging of next-generation battery cell architectures, iterating from active material synthesis to complete device assembly. Execute electrochemical synthesis, electroless/galvanic metal deposition, and hermetic sealing/coatings to optimize interfacial stability and device performance. Conduct comprehensive electrochemical characterization alongside flammability and safety evaluations on novel energy storage systems.
P.I. Joerg Werner
- ◇ **Technical Consultant – Battery Applications** **09/2026 - Present**
EXUM Instruments, Denver, Colorado (remote)
Represent EXUM at the Volta Foundation and lead technical customer engagements, positioning LALI-TOF-MS technology for battery industry adoption. Direct experimental design and author application notes, translating mass spectrometry demo data into impactful presentations and publishable collateral.

- ◇ **Postdoctoral Scholar**
08/2022 - 03/2026

Stanford Synchrotron Radiation Lightsource, SLAC National Accelerator Laboratory, Menlo Park, California.
 Project: X-rays to characterize high-energy, low-cost Li-metal batteries for the next-generation energy storage for electric vehicles. Battery chemistries may include Li||NMC and Li||S. And X-ray characterization of Li-ion cells during extreme fast charging to investigate the impacts of proposed solutions to increasing fast charging performance. P.I. Dr. Johanna Nelson Weker
- ◇ **Postdoctoral Researcher**
11/2021 - 04/2022

Instituto de Investigaciones en Materiales, Universidad Nacional Autónoma de México, Mexico City, Mexico.
 Project: Research and synthesis of ceramic materials of formula NaMO_2 , where M = Fe and Mn.
 P.I. Dr. Heriberto Pfeiffer Perea
- ◇ **Energy Engineer**
06/2021 - 10/2021

Vara Irrigacion, San Miguel Zacaola, Puebla.
 Activities: Electrical and hydraulic pumps installations, photovoltaic solar systems design and installations.
- ◇ **Teacher**
08/2020 - 06/2021

Instituto Interactivo Alfred Binet, San Andrés Cholula, Puebla.
 Courses: Sciences (Math and Physics).
- ◇ **Teaching assistant**
01/2018 - 04/2018

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
 Provided support in Thermal Physics.
- ◇ **Teaching assistant**
01/2017 - 07/2017

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
 Provided support in General Physics, Thermal Physics.
- ◇ **Interim Teacher**
01/2015 - 07/2015

Secondary School # 145, El Pozo, Chiapas.
 Courses: Sciences II and III (Physics and Chemistry).
- ◇ **Professional Internship**
09/2014 - 12/2014

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
 Energy Laboratory
 Activities: Assembly and start-up of ultrasonic pyrolytic spray equipment from Energy Laboratory at Institute of Physics, BUAP.

RESEARCH INTERESTS

I study how degradation starts and spreads in high-energy batteries, linking electrochemical performance to chemical and structural changes across length scales. I combine synchrotron X-ray methods with laser-based mass spectrometry to follow transition-metal crossover, SEI growth and lithium heterogeneity from single particles to pouch cells. I am now extending this work toward cell design: new architectures, more stable interfaces and safer devices.

- ◇ **Materials:** Li-metal and Si anodes; high-Ni layered cathodes (LiNiO_2 , NMC); Na-based oxides.

- ◇ **Degradation and interfaces:** transition-metal crossover, SEI growth, extreme fast charging, heterogeneity in large-format cells.
- ◇ **Characterization:** synchrotron XRD, XAS, TXM and μ -XRF; LALI-TOF-MS elemental mapping; multi-modal data analysis.
- ◇ **Cell design and safety:** novel cell architectures, interfacial stability, flammability evaluation.
- ◇ **Beyond batteries:** CO/CO₂ capture and catalysis on alkali ceramics.

PUBLICATIONS

1. Pallavi Thakur, **Erick Espinosa-Villatoro**, Mayuresh Savargaonkar, Aashray Narla, Pete Barnes, Johanna Nelson Weker, Eric J. Dufek, Bor-Rong Chen, "Heterogeneity Propagation and Surface Homogenization for Pouch-cell Sized Li Metal Anodes" (2026), Accepted in Cell Reports Physical Science Journal
DOI
2. **Erick Espinosa-Villatoro**, Otavio Marques, Zehao Cui, Penny Hyde, Zhiling Liang, Molleigh Preefer, Kevin Stone, Arumugam Manthiram, Johanna Nelson Weker, "Disentangling the role of Al, Co, and Mn dopants in LiNiO₂ cathodes *via* synchrotron-based probes", *Journal of Materials Chemistry A* (2026).
DOI: [10.1039/d6ta02574a](https://doi.org/10.1039/d6ta02574a).
3. **Erick Espinosa-Villatoro**, Sofia Barba, Ángel M. Gómez-Coronel, Johanna Nelson Weker, Edgar G. Villabona-Leal, Eduardo Ramos-Díaz, Joazeth Hiram, Maritza I. Pérez, Javier Alanis Pérez, "Crystalline structure-dependent performance of sodium titanates as anodes for Li-ion batteries", *Journal of Electroanalytical Chemistry* (2026).
DOI: [10.1016/j.jelechem.2026.120266](https://doi.org/10.1016/j.jelechem.2026.120266).
4. **Erick Espinosa-Villatoro**, Daniel G. Araiza, Heriberto Pfeiffer, "Exploring the capture and catalytic properties of sodium manganates: bifunctional ceramics for CO/CO₂ chemisorption and CO oxidation", *J. Environmental Management*, **401** (2026) 129026.
DOI: [10.1016/j.jenvman.2026.129026](https://doi.org/10.1016/j.jenvman.2026.129026).
5. V. Aca-López, **E. Espinosa-Villatoro**, J. D. Garay Marín, O. Pérez Díaz, E. Quiroga- González (2025), "Sustentabilidad Energética con Tecnologías de Almacenamiento Electroquímico" (pp. 135-161), In E. Gómez Arias, E. Cervantes Rendón, A. Rodríguez Martínez (Eds.), *Sustentabilidad Energética, Medioambiente y Sociedad: Avances en la Agenda 2030*. El Colegio de Chihuahua (CICESE). ISBN: 978-607-8214-82-2. Link: [Sustentabilidad Energética, Medioambiente y Sociedad](#).
6. **Erick Espinosa-Villatoro**, Johanna Nelson Weker, Jesse S. Ko, Enrique Quiroga-González, "Tracking the evolution of processes occurring in silicon anodes in lithium ion batteries by 3D visualization of relaxation times", *Journal of Electroanalytical Chemistry*, **892** (2021) 115309.
DOI: [10.1016/j.jelechem.2021.115309](https://doi.org/10.1016/j.jelechem.2021.115309).

CONFERENCES AND EVENTS

- ◇ **NESACS Battery Symposium 2026, Simmons University, Boston, Massachusetts, United States**
Poster presentation
Spatially Resolved Insights into TM Crossover and Li-Metal Anode Degradation via μ -XRF and LALI-TOF-MS

- ◇ **2025 MRS Fall Meeting and Exhibit, Hynes Convention Center, Boston, Massachusetts, United States**
Talk presentation
Exploring the interplay between transition-metal crossover and SEI growth in Li||high-Ni cathode half-cells
- ◇ **2025 SSRL/LCLS Users' Meeting, SLAC National Accelerator Laboratory, Menlo Park, United States**
Poster presentation
Tracking transition-metal crossover and SEI growth in Li||high-Ni cathodes via synchrotron techniques
- ◇ **PRiME 2024 ECS, Hawai'i, United States**
Talk presentation
Insights into the Performance Enhancement of Co and Mn Doped LiNiO₂ Cathodes Using Synchrotron Techniques
- ◇ **Vehicle Technologies Office Annual Review 2024, Arlington, Virginia, United States**
Attendee
- ◇ **Energy Storage Discussions 2023, Monterrey, Mexico**
Talk presentation
Synchrotron radiation insights into LiNiO₂ and Mn, Co-doped cathodes at different states of charge via TXM and XANES analysis
- ◇ **2023 SSRL/LCLS Users' Meeting, SLAC National Accelerator Laboratory, Menlo Park, United States**
Poster presentation
Synchrotron X-ray studies reveal extreme fast charging effects on NMC811 Li-ion battery cathodes
- ◇ **Clubes de Ciencia Mexico 2023, Xalapa, Veracruz, Mexico**
Instructor
Ampere's Amps: El poder de la electroquímica
- ◇ **XI International Workshop on Energy Conversion and Storage, Mexico City, Mexico**
Workshop Speaker
Synchrotron light to uncover changes in the Si anodes of Li-ion batteries preconditioned with Na
- ◇ **International Materials Research Congress 2022, Cancun, Mexico**
Poster presentation
NaFe_xMn_yO₂ as cathode material for lithium-ion batteries
- ◇ **International Materials Research Congress 2022, Cancun, Mexico**
Poster presentation
The influence of the crystalline phase in the electrochemical performance of NaFeO₂-based cathodes for lithium-ion batteries
- ◇ **International Materials Research Congress 2021, Cancun, Mexico**
Poster presentation
Effect of Na-preconditioning in the properties of silicon anodes for Li-ion batteries
- ◇ **I Congreso Nacional de la Sociedad Mexicana de Luz Sincrotrón - I Congreso Internacional de Técnicas de Luz Sincrotrón, Guanajuato, Mexico.**
"First Place" Dr. Fernando Matías Moreno Yntriago Award in Poster presentation

Study of the chemical, morphological and structural characteristics of Na-preconditioned Si anodes for lithium-ion batteries by synchrotron techniques

- ◇ **IV Simposio Interdisciplinario en Materiales 2021, Capítulo Estudiantil CINVESTAV-Zacatenco, Mexico City, Mexico.**
Poster presentation
Synchrotron chemical and structural analysis of Na-preconditioned silicon anodes for Li-ion batteries
- ◇ **LXIII Congreso Nacional de Física 2020, Online, Mexico**
Attendee
- ◇ **Energy Storage Discussions 2019, Mexico City, Mexico**
Talk presentation
Effect of Na-preconditioning of silicon anodes for Li-ion batteries
- ◇ **2019 SSRL/LCLS Users' meeting, SLAC National Accelerator Laboratory, California, United States**
Poster presentation
Synchrotron light to reveal changes in Si anodes of Li-ion batteries submitted to a Na preconditioning process
- ◇ **LXI Congreso Nacional de Física 2018, Puebla, Mexico**
Poster presentation
Pre-conditioning of silicon anodes by sodiation for lithium-ion batteries
- ◇ **International Materials Research Congress 2018, Cancun, Mexico**
Poster presentation
Pre-conditioning of silicon anodes by sodiation for lithium-ion batteries
- ◇ **Baja Dimensionalidad 2018, Puebla, Mexico**
Poster presentation
Efecto del pre-acondicionamiento mediante sodiación en ánodos de Si para baterías de ion Li
- ◇ **Energy Storage Discussions 2017, Puebla, Mexico**
Poster presentation
Pre-conditioning of silicon anodes by sodiation for lithium-ion batteries
- ◇ **Transporte Eléctrico, Innovación tecnológica, oportunidades de inversión y desarrollo para la industria 2017, Cuernavaca, Mexico**
Instituto Nacional de Electricidad y Energías Limpias
Participation
- ◇ **Energy Storage Discussions 2016, Puebla, Mexico**
Participation
Logistic Support

COURSES AND DIPLOMAS

- ◇ **6th US School on Total Scattering Analysis**
Jun 2024
Oak Ridge National Laboratory, Oak Ridge, Tennessee, United States.

- ◇ **IX International Workshop on Energy Conversion and Storage 2020**
Oct 2020
CICATA-Legaria, Instituto Politécnico Nacional, Mexico City, Mexico.
- ◇ **Fundamentos de la Microscopía Electrónica de Barrido y EDS**
Oct 2020
El capítulo estudiantil CINVESTAV-Zacatenco, la Sociedad Mexicana de Materiales y JEOL México, Mexico City, Mexico.
- ◇ **Workshop Battery Simulation**
Oct 2019
ESFM (ESD2019), Instituto Politécnico Nacional, Mexico City, Mexico.
- ◇ **Workshop Supercapacitors**
Oct 2019
ESFM (ESD2019), Instituto Politécnico Nacional, Mexico City, Mexico.
- ◇ **Diplomate in Complex Systems**
Feb 2018 - May 2018
Faculty of Biological Science, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.
- ◇ **Science Journalism Workshop**
Jun 2017
Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.

SKILLS

- ◇ **Cell fabrication and assembly:** coin, pouch and Swagelok cells; custom cell architectures and packaging; hermetic sealing and coatings.
- ◇ **Electrochemistry:** galvanostatic cycling, cyclic voltammetry, impedance spectroscopy and relaxation-time analysis; degradation and stability studies; flammability and safety evaluation.
- ◇ **Synchrotron X-ray characterization:** ex situ and *operando* TXM, XRD, μ -XRF and μ -XAS at SSRL; STXM and ptychography at ALS beamline 7.0.1 (COSMIC); X-ray computed tomography with 3D reconstruction.
- ◇ **Mass spectrometry and elemental analysis:** LALI-TOF-MS quantitative analysis and high-resolution elemental mapping, in collaboration with the EXUM Instruments development team; thermogravimetric analysis.
- ◇ **Laboratory characterization:** XRD (Rigaku, Siemens, PANalytical Empyrean), SEM, AFM, XPS; electrical and semiconductor characterization.
- ◇ **Materials synthesis:** co-precipitation and solid-state synthesis of Li- and Na-based oxides (sodium manganates, ferrites); electrochemical synthesis; electroless and galvanic metal deposition.
- ◇ **Data analysis and programming:** Python and MATLAB for automated processing, visualization and cross-technique correlation of multimodal datasets.

LANGUAGES

Spanish: Native

English: Fluent