

Erick Espinosa-Villatoro, Ph.D.

Materials Scientist | Battery R&D | Advanced Characterization & Failure Analysis
Somerville / Greater Boston Area

Summary

erickleoev@gmail.com | 650-417-1610 | www.erickev.com

Innovative Materials Scientist and R&D Engineer with 9+ years of experience leading advanced analytical characterization, electrochemistry, and root-cause failure analysis for next-generation energy storage and functional materials. Proven expert in operando/in situ X-ray diagnostics (XAS, TXM, XRD), surface science, and Python-driven data automation. Skilled at translating complex chemical, structural, and interfacial diagnostics into actionable materials engineering solutions across external stakeholder management and commercial engineering partnerships. Adept at bridging the gap between fundamental materials synthesis and commercial battery performance.

Technical Skills

- **Analytical & Surface Characterization:** SEM, XPS, AFM, Cryo-EM, LALI-TOF-MS (EXUM Massbox), STXM-ptychography, 3D chemical mapping, non-destructive evaluation (NDE).
- **Synchrotron & X-ray Methods:** Operando & ex-situ XAS (μ -XANES, EXAFS), Transmission X-ray Microscopy (TXM), X-ray Diffraction (XRD), μ -XRF.
- **Electrochemistry & Testing:** Cyclic Voltammetry (CV), Electrochemical Impedance Spectroscopy (EIS / DRT analysis), galvanostatic cycling, rate capability, safety & flammability testing, formation protocols.
- **Battery Systems & Packaging:** Custom cell architecture & design, hermetic sealing, metal plating (electroless/galvanic), pouch/coin cell assembly; Ni-rich cathodes (LiNiO₂), Li-metal, Silicon anodes, Sodium-ion (NaMO₂), SEI/CEI stability.
- **Computation & Data Automation:** Python (NumPy, SciPy, Matplotlib, Imfit), custom spectral fitting, automated data pipeline analysis, multidimensional dataset visualization.

Research & Consulting Experience

Research Scientist

2026 – Present

Mesostructured Materials and Devices Lab (Werner 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.

Technical Consultant – Battery Applications

2026 – Present

EXUM Instruments

- 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 (Lead R&D Scientist)

2022 – 2026

Stanford Synchrotron Radiation Lightsource (SSRL - Weker Group), SLAC National Accelerator Laboratory, Stanford University

- Led operando/ex-situ synchrotron X-ray diagnostics (XAS, TXM, XRD) across Ni-rich cathodes and Li-metal chemistries to identify structural degradation mechanisms and guide high-energy material design.
- Spearheaded multimodal surface/elemental characterization (μ -XRF, μ -XANES, LALI-TOF-MS), quantifying transition-metal crossover, SEI layer growth, and 3D defect evolution with Idaho National Laboratory (INL).
- Managed cross-functional engineering partnerships, directed project deliverables, and trained technical staff across multi-institutional collaborations.

Postdoctoral Scientist (Materials Research Engineer)

2021 – 2022

Instituto de Investigaciones en Materiales, UNAM

- Synthesized NaMO₂ ($M = \text{Fe, Mn}$) ceramic materials via solid-state and co-precipitation routes for energy storage and high-temperature gas adsorption applications.
- Executed process optimization and evaluated kinetic reaction mechanisms to achieve up to 9.5% CO₂ capture at 800°C and 100% CO conversion at 450°C.

Ph.D. Researcher (R&D Engineer)

2017 – 2021

Benemérita Universidad Autónoma de Puebla (BUAP) & SSRL, SLAC

- Developed novel Na-preconditioning chemical strategies for Silicon anodes, mitigating capacity fade and enhancing SEI interfacial stability in Li-ion battery systems.
- Developed a novel metrology standard utilizing a 3D relaxation-time analytical methodology that successfully pinpointed localized electrode failure mechanisms.

Education

Ph.D. in Materials Science | Benemérita Universidad Autónoma de Puebla, Mexico

2017 – 2021

M.Sc. in Materials Science | Benemérita Universidad Autónoma de Puebla, Mexico

2015 – 2016

B.E. in Energy Engineering | Universidad Politécnica de Chiapas, Mexico

2011 – 2014

Additional Information

- **Languages:** English (Fluent), Spanish (Native)
- **Selected Publications:** Lead and co-author on multiple high-impact peer-reviewed publications across [Journal of Materials Chemistry A](#), [Journal of Electroanalytical Chemistry](#), [Journal of Environmental Management](#) (full list available upon request).