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## Erick Leonel Espinosa Villatoro

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### EDUCATION

- ◇ **Ph.D. in Material 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 Material 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

- ◇ **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  $\text{NaMO}_2$ , where M = Fe and Mn.  
P.I. Dr. Heriberto Pfeiffer Perea
- ◇ **Energy Engineer** **06/2021 – 10/2021**  
Aqua 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

- Si anodes
- Li-metal batteries
- NMC cathodes
- Li-ion, Na-ion batteries
- Synchrotron radiation characterization (XRD, XAS, TXM, XRF)
- Synchrotron data analysis
- Laser Ablation Laser Ionization Mass Spectrometry (LALI-TOF-MS)
- Energy storage and conversion
- Electrochemical characterization of materials
- Morphological characterization of materials (SEM, AFM, TEM)
- Cryogenic Electron Microscopy
- DFT simulations
- Catalysis
- Adsorption or sorption processes

## 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), Submitted to 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 LiNiO<sub>2</sub> 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/CO<sub>2</sub> 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 Elec- troquímico" (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

- ◇ **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 LiNiO<sub>2</sub> 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  $\text{LiNiO}_2$  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  
 $\text{NaFe}_x\text{Mn}_y\text{O}_2$  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  $\text{NaFeO}_2$ -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**

- ◇ **6<sup>th</sup> 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**

- ◇ Demonstrated strong teamwork, self-directed learning, and advanced computational skills across multidisciplinary research projects.
- ◇ Communicated complex scientific results clearly and effectively to supervisors, collaborators, and peers through written reports, presentations, and publications.
- ◇ Performed advanced synchrotron characterization for *ex-situ* and *operando* studies at SSRL (TXM, XRD,  $\mu$ -XRF,  $\mu$ -XAS) and at ALS beamline 7.0.1 (COSMIC) using STXM and ptychography.
- ◇ Conducted X-ray computed tomography to obtain and analyze 3D microstructural reconstructions of battery and functional materials.
- ◇ Executed quantitative and qualitative elemental analysis and high-resolution elemental mapping using Laser Ablation Laser Ionization Time-of-Flight Mass Spectrometry (LALI-ToF-MS) and close collaboration with development team from EXUM Instruments.
- ◇ Performed quality control, compositional verification, and synthesis optimization using mass spectrometry and thermogravimetric analysis.
- ◇ Characterized structural, morphological, and surface properties using XRD (Rigaku, Siemens, PANalytical Empyrean), SEM, AFM, and XPS, as well as electrical and semiconductor characterization techniques.
- ◇ Interpreted multimodal characterization datasets and generated reproducible analysis workflows using Python, MATLAB, and technique-specific software.
- ◇ Synthesized Li- and Na-based materials (e.g., sodium manganates, ferrites) via co-precipitation and solid-state methods for energy storage, gas capture, and oxidation applications.
- ◇ Developed Python and MATLAB scripts for automated data processing, visualization, and cross-technique correlation.
- ◇ Performed electrochemical characterization using cyclic voltammetry, electrochemical impedance spectroscopy, galvanostatic cycling, and related techniques.
- ◇ Evaluated electrochemical performance, degradation behavior, and stability of synthesized materials for next-generation energy storage applications.

**LANGUAGES**

Spanish: Native

English: Fluent

## REFERENCES

- ◇ Johanna Nelson Weker, Ph.D.  
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- ◇ Molleigh B. Preefer, Ph.D.  
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- ◇ Jagjit Nanda, Ph.D.  
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- ◇ Jesse S. Ko, Ph.D.  
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- ◇ Enrique Quiroga González, Ph.D.  
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- ◇ Juan David Garay Marín, Ph.D.  
juandavid2756@gmail.com

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I, at this moment, declare that all information contained in this curriculum vitae is factually correct and complete.