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## Erick Leonel Espinosa Villatoro

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### EDUCATION

- ◇ **Ph.D. in Material Science** **Jan 2017 - Jun 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** **Aug 2015 - Dec 2016**  
Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.  
CONACyT Scholarship.
  
- ◇ **B.E. Energy Engineering** **Aug 2011 - Dec 2014**  
Universidad Politécnica de Chiapas, Suchiapa, Chiapas, Mexico.
  
- ◇ **High School** **Aug 2008 - Jul 2011**  
Centro de Bachillerato Tecnológico Industrial y de Servicios 092, San Cristobal de las Casas, Chiapas, Mexico.  
SEP Scholarship.

### PROFESSIONAL AND RESEARCH INTEREST

- ◇ **Postdoctoral Scholar** **Aug 2022 - Ongoing**  
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 Scientist** **Nov 2021 - Apr 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  $M = \text{Fe}$  and  $\text{Mn}$ .  
P.I. Dr. Heriberto Pfeiffer Perea
- ◇ **Energy Engineer** **Jun 2021 - Oct 2021**  
Aqua Irrigation, San Miguel Zacaola, Santo Tomás Hueyotlipan, Puebla.  
Activities: Electrical installations of hydraulic pumps, photovoltaic systems installation, and designer of the company's website.
- ◇ **Teacher** **Aug 2020 - Jun 2021**  
Instituto Interactivo Alfred Binet, San Andrés Cholula, Puebla.  
Courses: Sciences (Math and Physics).
- ◇ **Professor Assistant, for teaching** **Jan 2018 - Apr 2018**  
Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.  
Course: Thermal Physics.
- ◇ **Professor Assistant, for teaching** **Jan 2017 - Jul 2017**  
Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.  
Courses: General Physics, Thermal Physics.
- ◇ **Interim Teacher** **Jan 2015 - Jul 2015**  
Secondary School # 145, El Pozo, Chiapas.  
Courses: Sciences II and III (Physics and Chemistry).
- ◇ **Professional Internship** **Sep 2014 - Dec 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

- Li-metal batteries
- NMC cathodes
- Li-ion, Na-ion batteries
- Synchrotron radiation characterization
- Synchrotron data analysis
- Micro X-ray Fluorescence Spectroscopy ( $\mu\text{-XRF}$ )
- Micro X-ray Absorption Near Edge Structure ( $\mu\text{-XANES}$ )

- Energy storage and conversion
- Electrochemical characterization of materials
- Impedance spectroscopy characterization
- Morphological characterization of materials
- Programming: Python, MatLab, Machine Learning
- DFT simulations
- Complex Systems
- Catalysis
- Adsorption or sorption processes
- Fuel cells

## PUBLICATIONS

1. **E. Espinosa-Villatoro**, J. Nelson Weker, J. S. Ko, E. Quiroga-González, "Tracking the evolution of processes occurring in silicon anodes in lithium ion batteries by 3D visualization of relaxation times", *J. Electroanal. Chem.*, **892** (2021) 115309.  
DOI: 10.1016/j.jelechem.2021.115309.
2. **E. Espinosa-Villatoro**, J. Nelson Weker, J. S. Ko, A. Santillán-Guzmán, E. Quiroga-González, "Effect of Na-preconditioning of Silicon Anodes for Li-ion Batteries", *Drafted*  
DOI: –.
3. **E. Espinosa-Villatoro**, Daniel G. Araiza, Nadia Oropeza-Miranda, Heriberto Pfeiffer, "Exploring the carbon oxide capture properties of sodium manganates: NaMnO<sub>2</sub> as bifunctional material for the CO oxidation and CO<sub>2</sub> capture", *Drafted*  
DOI: –.
4. **E. Espinosa-Villatoro**, Daniel G. Araiza, Heriberto Pfeiffer, "The influence of the crystalline phase in the electrochemical performance of NaFeO<sub>2</sub>-based cathodes for lithium-ion batteries", *Drafted*  
DOI: –.

## CONFERENCES AND EVENTS

- ◇ **Energy Storage Discussions 2023, Monterrey, Mexico**  
Talk presentation  
Synchrotron radiation insights into LiNiO<sub>2</sub> 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.

- ◇ **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<sub>x</sub>Mn<sub>y</sub>O<sub>2</sub> 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 NaFeO<sub>2</sub>-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**  
Participation
- ◇ **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.
- ◇ **Energy Storage Discussions 2017, Puebla, 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

- ◇ **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.

## **DIVULGATION**

◇ **Journal - Conciencia Estudiantil -**

Sep 2021

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.

Article name: "Investigación y desarrollo de nuevos medicamentos"

Year 8, Num 01, Spring 2021

Editorial committee member and "Portada" section co-author

◇ **Journal - Conciencia Estudiantil -**

Feb 2021

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.

Article name: "La Carrera Espacial a Marte"

Year 7, Num 02, Summer 2020

Editorial committee member and "Portada" section co-author

◇ **Journal - Conciencia Estudiantil -**

May 2019

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.

Article name: "Una nueva generación de baterías"

Year 6, Num 02, Summer 2019

"Actualidad" section author

◇ **Journal - Conciencia Estudiantil -**

Aug 2018

Institute of Physics, Benemérita Universidad Autónoma de Puebla, Puebla, Mexico.

Year 5, Num 01, Summer 2018

Editorial committee member

## **SKILLS**

- ◇ Demonstrated teamwork, self-learning initiative, and good computer skills throughout the research projects.
- ◇ Communicated effectively with supervisors, collaborators, and peers in oral and written forms.

- ◇ Synthesized Na and Li-based samples (sodium manganates and ferrites) using co-precipitation and solid-state synthesis methods for energy storage, capture and oxidation applications.
- ◇ Performed quality control and optimization of synthesis parameters using Mass Spectrometer and Thermogravimetric Equipment.
- ◇ Analyzed the structural, morphological, and compositional properties of synthesized samples using lab X-Ray Diffractometer (Rigaku, Siemens, PANalytical Empyrean), Surface Analysis (SEM, AFM, XPS), Electrical Characterization and Semiconductors techniques.
- ◇ Quantitative and qualitative elemental analysis and elemental mapping by means of Laser Ablation Time of Flight Mass Spectrometer.
- ◇ Conducted advanced characterization with synchrotron radiation (TXM, XRD,  $\mu$ -XRF,  $\mu$ -XANES) at ALS beamline 7.0.1 (COSMIC) for STXM and Ptychography techniques.
- ◇ Performed X-ray computed tomography to obtain 3D images of the internal structure of samples.
- ◇ Interpreted and reported the characterization results using data analysis software for each technique.
- ◇ Programmed in MatLab and Python languages for data analysis, visualization, and automation of tasks.
- ◇ Good electrochemical analysis and characterization skills (cyclic voltammetry, electrochemical impedance spectroscopy, galvanostatic tests, and others).
- ◇ Performed electrochemical analysis and characterization of synthesized samples using cyclic voltammetry, electrochemical impedance spectroscopy, galvanostatic tests, and others.
- ◇ Evaluated the electrochemical performance and stability of samples for energy storage applications.

## LANGUAGES

Spanish: Native

English: Fluent

*Last updated: Nov 20, 2023*

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