

Sebastián González-Ramírez

Profile

PhD in Chemical Engineering from the University of Leeds, where my doctoral research focused on valorizing petroleum asphaltene into carbon-based electrode materials for capacitive deionization (conventional and faradaic) of cesium-contaminated water. I possess expertise in carbon materials synthesis and functionalization, chemical and physical characterization techniques, and electrochemical remediation and performance evaluation. I have a strong fundamental understanding of electrochemical theory and mechanisms and extensive experience carrying out electrochemical experiments and measurements.

Education

University of Leeds

Leeds, England

PhD, Chemical Engineering - **Valorisation of petroleum asphaltene as electrode materials for the electrochemical remediation of Cs-contaminated water using Capacitive Deionization.**

Nov 2019 – Mar 2026

- Developed functionalized activated carbons for enhanced capacitive deionization performance using asphaltene as the carbon precursor.
- Synthesized the first asphaltene-derived carbon aerogels, demonstrating continuous electrochemical Cs uptake at both polarities within a single material, achieving ultra-high adsorption capacity (2.27 mmol g^{-1}).
- Elucidated the electrochemical Cs uptake mechanisms of the synthesized aerogels through systematic combined electrochemical (CV & EIS) and physicochemical (XPS, SEM, TEM) characterization, revealing dual mechanisms at negative polarity (voltage-dependent intercalation and capacitive uptake) and pseudocapacitive redox reactions at positive polarity.
- Created asphaltene oxide-chitosan cross-linked aerogels with long-range structural order (cm scale), thereby improving mechanical performance whilst retaining a high Cs removal capacity for free-standing flow-through electrode applications.
- Developed PVA-modified asphaltene oxide electrode ink for direct casting of custom-shaped flexible aerogel electrodes.
- Systematically characterized materials using chemical (FTIR, XPS, CHNS-O, TGA) and physical (TEM, SEM, BET, XRD) techniques to establish structure-property-performance relationships and guide synthesis optimization.
- Performed comprehensive electrochemical analysis (CV, GCD, EIS) of each material to elucidate charge storage mechanisms, quantify performance metrics, and diagnose degradation mechanisms.

Universidad de Sonora

Hermosillo, Mexico

BSc, Chemical Engineering

Aug 2013 – Dec 2017

- 8.5/10 GPA
- **Specialized Modules:** Material Characterization, Sustainable Energy and Development, and Mechanical Processing of Minerals.
- **Industry Internship: Pyrometallurgy Engineering Intern, Molymex S.A. de C.V.**
Developed computational fluid dynamics model for rotary furnace airflow optimization, improving temperature control accuracy and reducing energy consumption
- **Social Service Project:** Fabricated thin-film silicon solar cells for Renewable Energy Master's students.

Work Experience

Research Assistant - Short term contract

University of Leeds, Harbottle Group

Leeds, England

Oct 2023 – Jan 2024

- Optimized asphaltene-based carbon aerogel synthesis routes, achieving a 113% improvement in mechanical strain resistance with no drop-off in performance.
- Conducted additional aerogel characterization studies to support broader group research objectives.

Lab Captain

UoL SCAPE, Labs 2.03 and 2.43

Leeds, England

Dec 2022 – July 2024

- Managed laboratory operations, ensuring compliance with safety standards and supporting energy storage-related research projects.
- Carried out chemical organization and disposal in accordance with Health & Safety Standards.
- Trained students in the correct use of multiple electrochemical-related instruments.
- Organized lab cleaning sessions to maintain good lab practices.

Skills

Carbon-based materials synthesis and functionalization

- Synthesized aerogels, activated carbon, few-layer graphene, graphene, nanosheets, and carbon sponges.

Materials Characterization:

- Expert: TGA, FT-IR, SEM, CHNS-O, BET, XRD.
- Competent: TEM, XPS.

Electrochemical Techniques:

- Expert: Cyclic Voltammetry, Electrochemical Impedance Spectroscopy, Galvanostatic Charge-Discharge.
- Competent: Chronoamperometry, Linear Sweep Voltammetry.

Analytical Techniques:

- Expert: Atomic Absorption Spectroscopy.
- Competent: Ion Chromatography, ICP-OES.

Languages: Spanish (Native), English (C2), Arabic (Spoken, A2), Persian (A2)

Leadership: President of the Mexican Society at the University of Leeds (2023-2024).

Publications

1. **Electrochemical Remediation of Cs-contaminated Water by Adsorption under Dual Electrode Polarities: Application of Water-Dispersible Asphaltene-derived Carbon Nanoplatelet Aerogels** (Main and First author, Under Review by Chemical Engineering Journal, IF 13.2)

Summary: synthesis of the first asphaltene-derived carbon aerogel and its application for the electrochemical remediation of Cs-contaminated water. The aerogel exhibited an ultra-high Cs adsorption capacity of 2.27 mmol g⁻¹ through three distinct mechanisms: capacitive and intercalation mechanisms at the negative polarity and pseudocapacitive redox reactions at the positive polarity.

2. **Enhanced cesium removal from clay minerals using surfactant-assisted capacitive deionization** (Co-author, Chemical Engineering Journal, IF 13.2)

Summary: Developed and validated a novel combined capacitive deionisation–surfactant intercalation approach for remediation of caesium-contaminated soils, achieving >90% Cs⁺ removal within 1 hour across both kaolinite and montmorillonite clay systems.