

Raul A. Marquez

Department of Chemistry, The University of Texas at Austin

Phone: +1(737) 703-2326 | Email: raul.marquez@utexas.edu | [ORCID](#) | Academic Website

Executive Summary

Analytical chemist and engineer with 8+ years of distinguished research in electrocatalysis, materials chemistry, and electrochemical engineering. Extensive hands-on experience in device prototyping, materials characterization, and electrochemical techniques, underpinned by a strong record of publications and successful project leadership. Committed to establishing a top research group dedicated to studying electrochemical phenomena, aiming to innovate technologies and materials that align with global sustainable development goals.

Education

The University of Texas at Austin August 2020 - Present
 Ph.D. Candidate, Chemistry, Analytical Chemistry Division *GPA 4.0*
 Advisor: Prof. C. Buddie Mullins, Photoelectrochemistry subgroup.
Anticipated Graduation Date: 05/2025

Universidad Autonoma de Chihuahua August 2018 – June 2020
 M.S. Chemistry, *Cum Laude* Academic Honor *GPA 4.0*
 Advisor: Prof. Víctor Hugo Ramos-Sánchez, Renewable Energy subgroup.
 Thesis: "Examining and Optimizing Sulfite Electrooxidation in a Parallel-plate Reactor"

Universidad Autonoma de Chihuahua August 2012 – November 2017
 B.E. Chemical Engineering, *Cum Laude* Academic Honor *GPA 4.0*
 Advisor: Prof. Víctor Hugo Ramos-Sánchez, Renewable Energy subgroup.
 Thesis: "Design of an Electrochemical Membrane Reactor for Hydrogen Production via the Hybrid Thermochemical Sulfur-Ammonia Cycle"

Publications (First-author: 12, Co-authored: 11, h-index: 11)

Completed at UT-Austin.

23. Marquez, R.A., Kalokowski, E., Espinosa, M., Ramos-Sánchez, V.H., Rodríguez-Pacheco, L.C., Valenzuela-De la Rosa, F., Mullins, C.B. Teaching Electrochemical Energy Conversion and Storage Through Active Learning: Insights from Science Workshops. *Submitted to Journal of Chemical Education*.
22. Marquez, R.A., Obeso, J.L., Vaidyula, R.R., López-Cervantes, V.B., Peralta, R.A., Marín Rosas, P., De los Reyes, J.A., Mullins, C.B., Ibarra, I.A. From Pollution to Energy Storage: Leveraging Hydrogen Sulfide with SU-101 Cathodes in Lithium-Sulfur Batteries. *Submitted to Materials Horizons*.
21. Marquez, R.A., Oefelein, E.E., Le, T.V., Kawashima, K., Le, T.V., Smith, L.A., Mullins, C.B. Redefining the Stability of Water Oxidation Electrocatalysts: Insights from Materials Databases and Machine Learning. *Submitted to ACS Materials Letters*.
20. Marquez, R.A., Espinosa, M., Kalokowski, E., Son, Y.J., Kawashima, K., Le, T.V., Chukwuneke, C.E., Mullins, C.B. A Guide to Electrocatalyst Stability Using Lab-Scale Alkaline Water Electrolyzers. *ACS Energy Letters*, **2024**, 9, 2, 547–555. [Link](#)
19. Marquez, R.A., Kalokowski, E., Espinosa, M., Bender, J.T., Son, Y.J., Kawashima, K., Chukwuneke, C., Smith, L.A., Celio, H., Dolocan, A., Zhan, X., Miller, N.R., Milliron, D.J., Resasco, J., Mullins, C.B. Transition metal incorporation: electrochemical, structure, and chemical effects on nickel oxyhydroxide oxygen-evolution electrocatalysts. *Energy & Environmental Science*, **2024**, 17, 2028-2045. [Link](#)

18. Kawashima, K.,* [Marquez, R.A.](#),* Smith, L.A., Vaidyula, R.R., Carrasco-Jaim, O.A., Wang, Z., Son, Y.J., Cao, C.L., Mullins, C.B. A Review of Transition Metal Boride, Carbide, Pnictide, and Chalcogenide Water Oxidation Electrocatalysts. *Chemical Reviews*, **2023**, 123, 23, 12795–13208. [Link](#) *Equal contributors.
17. Chukwuneke, C., Kawashima, K., Li, H., [Marquez, R.A.](#), Son, Y.J., Celio, H., Henkelman, G., Mullins, C.B. Electrochemically Engineered Domain: Nickel–Hydroxide/Nickel Nitride Composite for Alkaline HER Electrocatalysis. *Journal of Materials Chemistry A*, **2023**, 12, 1654-1661. [Link](#)
16. Son, Y.J., [Marquez, R.A.](#), Kawashima, K., Smith, L.A., Chukwuneke, C., Babauta, J., Mullins, C.B. Navigating *iR* Compensation: Practical Considerations for Accurate Study of Oxygen Evolution Catalytic Electrodes. *ACS Energy Letters*, **2023**, 8, 10, 4323–4329. [Link](#)
15. [Marquez, R.A.](#), Kawashima, K., Son, Y.J., Castelino, G., Miller, N.R., Smith, L.A., Chukwuneke, C., Mullins, C.B. Getting the Basics Right: Preparing Alkaline Electrolytes for Electrochemical Applications. *ACS Energy Letters*, **2023**, 8, 2, 1141–1146. [Link](#)
14. Kawashima, K., [Marquez, R.A.](#), Son, Y.J., Guo, C., Vaidyula, R.R., Smith, L.A., Chukwuneke, C., Mullins, C.B. Accurate Potentials of Hg/HgO Electrodes: Practical Parameters for Reporting Alkaline Water Electrolysis Overpotentials. *ACS Catalysis*, **2023**, 13, 3, 1893–1898. [Link](#)
13. Son, Y.J., Kawashima, K., [Marquez, R.A.](#), Smith, L.A., Chukwuneke, C., Mullins, C.B. Key concepts for understanding alkaline oxygen evolution reaction at the atomic/molecular scale. *Current Opinion in Electrochemistry*, **2023**, 39, 101298. [Link](#)
12. Wang, Z., Diao, J., Kawashima, K., Weeks, J.A., Vaidyula, R.R., [Marquez, R.A.](#), Miller, N.R., Henkelman, G., Mullins, C.B. Unveiling the reaction mechanism of capacity reactivation in silver vanadate cathodes for aqueous zinc-ion batteries. *Journal of Materials Chemistry A*, **2023**, 11, 35, 18881-18892. [Link](#)
11. [Marquez, R.A.](#), Kawashima, K., Son, Y.J., Rose, R., Smith, L.A., Miller, N.R., Carrasco-Jaim, O.A., Celio, H., Mullins, C.B. Tailoring 3D-Printed Electrodes for Enhanced Water Splitting. *ACS Applied Materials & Interfaces*, **2022**, 14, 37, 42153–42170. [Link](#)
10. Son, Y.J., Kim, S., Leung, V., Kawashima, K., Noh, J., Kim, K., [Marquez, R.A.](#), Carrasco-Jaim, O.A., Smith, L.A., Celio, H., Milliron, D.J., Korgel, B.A., Mullins, C.B. Effects of Electrochemical Conditioning on Nickel-Based Oxygen Evolution Electrocatalysts. *ACS Catalysis*, **2022**, 12, 16, 10384–10399. [Link](#)
9. Kawashima, K., [Marquez-Montes, R.A.](#), Li, H., Shin, K., Cao, C.L., Vo, K.M., Mullins, C.B. Electrochemical behavior of a Ni₃N OER precatalyst in Fe-purified alkaline media: the impact of self-oxidation and Fe incorporation. *Materials Advances*, **2021**, 2, 7, 2299-2309. [Link](#)
8. [Marquez-Montes, R.A.](#), Kawashima, K., Son, Y.J., Weeks, J.A., Sun, H.H., Celio, H., Mullins, C.B. Mass transport-enhanced electrodeposition of Ni–S–P–O films on nickel foam for electrochemical water splitting. *Journal of Materials Chemistry A*, **2021**, 9, 12, 7736-7749. [Link](#)
7. [Marquez-Montes, R.A.](#), Kawashima, K., Vo, K.M., Chávez-Flores, D., Collins-Martínez, V.H., Mullins, C.B., Ramos-Sánchez, V.H. Simultaneous sulfite electrolysis and hydrogen production using Ni foam-based three-dimensional electrodes. *Environmental Science & Technology*, **2020**, 54, 19, 12511-12520. [Link](#)
6. Kawashima, K., Cao, C.L., Li, H., [Marquez-Montes, R.A.](#), Wygant, B.R., Son, Y.J., Mullins, C.B. Evaluation of a V₈C₇ Anode for Oxygen Evolution in Alkaline Media: Unusual Morphological Behavior. *ACS Sustainable Chemistry & Engineering*, **2020**, 8, 37, 14101-14108. [Link](#)

Papers Prior to Attendance at UT-Austin

5. Orozco-Mena, R.E., [Marquez, R.A.](#), Mora-Domínguez, K.I., Collins-Martínez, V.H., Herrera-Peraza, E.F., Perez-Vega, S.B., Ramos-Sánchez, V.H. Implementing a sustainable photochemical step to produce value-added products in flue gas desulfurization. *Chemical Engineering Journal*, **2020**, 430, 133072. [Link](#)
4. Sánchez-Hernández, L.J., Ramírez-Romero, P., Rodríguez-González, F., Ramos-Sánchez, V.H., [Marquez-Montes, R.A.](#), Romero-Paredes Rubio, H., Jonathan, M.P. Seasonal evidences of microplastics in environmental matrices of a tourist dominated urban estuary in Gulf of Mexico, Mexico. *Chemosphere*, **2021**, 277, 130261. [Link](#)

3. Marquez-Montes, R.A., Orozco-Mena, R.E., Camacho-Dávila, A.A., Pérez-Vega, S., Collins-Martínez, V.H., Ramos-Sánchez, V.H. Optimization of the electrooxidation of aqueous ammonium sulfite for hydrogen production at near-neutral pH using response surface methodology. *International Journal of Hydrogen Energy*, **2020**, 45, 27, 13821-13831. [Link](#)
2. Marquez-Montes, R.A., Collins-Martínez, V.H., Pérez-Reyes, I., Chávez-Flores, D., Graeve, O.A., Ramos Sánchez, V.H. Electrochemical engineering assessment of a novel 3D-printed filter-press electrochemical reactor for multipurpose laboratory applications. *ACS Sustainable Chemistry & Engineering*, **2020**, 8, 9, 3896-3905. [Link](#)
1. Marquez-Montes, R.A., Orozco-Mena, R.E., Lardizábal-Gutiérrez, D., Chávez-Flores, D., López-Ortíz, A., Ramos-Sánchez, V.H. Sulfur dioxide exploitation by electrochemical oxidation of sulfite in near-neutral pH electrolytes: A kinetics and mechanistic study. *Electrochemistry Communications*, **2019**, 104, 106481. [Link](#)

Honors and Awards

Provost's Graduate Excellence Fellowship, UT-Austin, includes below:	Aug. 2020 - May 2025
Morton Share Trust Graduate Fellowship	Spring 2021 - Fall 2023
Royston M. Roberts Fellowship in Chemistry	Fall 2020
Maddin Endowed Scholarship in Chemistry	Fall 2020
International Doctoral Fellowship Program, CONAHCyT	Sep. 2021 - Aug. 2025
Edward G. Weston Summer Fellowship, The Electrochemical Society	April 2024
Jeff Byers Memorial Graduate Award in Chemistry and Chemical Engineering, UT-Austin	April 2024
#RSCPoster competition 2024 (1 st place, Energy category), The Royal Society of Chemistry	Mar. 2024
#RSCPosterPitch award 2024, The Royal Society of Chemistry	Mar. 2024
Chemistry Department Service Award 2024, UT-Austin	Mar. 2024
<i>Materials Horizons</i> Community Board Member, The Royal Society of Chemistry	Oct. 2023
ECS Texas Section Travel Award, 244 th ECS Meeting	Oct. 2023
General Student Poster Session Award (1 st place), 243 rd ECS Meeting, The Electrochemical Society	May 2023
ECS Texas Section Travel Award, 243 rd ECS Meeting, The Electrochemical Society	May 2023
Master Thesis Competition (1 st place), Mexican Hydrogen Society	Sep. 2022
Faraday 2021 Teaching Award, UT-Austin	Nov. 2021
Henze 2021 Teaching Award, UT-Austin	May. 2021
Chemistry Department Service Award 2021, UT-Austin	Mar. 2021
M.S. Chemistry, <i>Cum Laude</i> Academic Honor, UACH	Jun. 2020
Matías Romero Visiting Scholars Program, UT-Austin	Jul. 2019
B.E. Chemical Engineering, <i>Cum Laude</i> Academic Honor, UACH	Nov. 2017
Harry West Student Poster Award (1 st place), AIChE Annual Meeting	Nov. 2017
Oral Presentation Contest (1 st place), Young Researchers Symposium, CONACyT	Sep. 2016

Research Experience

Graduate Research Assistant , The University of Texas at Austin	Aug. 2020 - Present
Department of Chemistry <i>Mullins Research Group</i>	

Understanding electrocatalytic stability during alkaline water electrolysis

- Investigated the effects of intermittent water electrolysis on the surface composition and dissolution of transition metal-based electrocatalysts.
- Studied the chemical, structural, and electrochemical performance effects of the *in situ* incorporation of metal impurities into transition metal-based electrocatalysts.
- Developed protocols to test electrocatalyst stability using lab-scale alkaline water electrolyzers.
- Developed protocols to purify and determine trace metal impurities in alkaline electrolytes using inductively coupled plasma mass spectrometry and electrochemical methods.
- Development of automated potentiostat sequences for examining electrocatalytic performance.
- Electrodeposition of electrocatalysts with thin film architecture.

Electrocatalytic performance of earth-abundant catalysts for water splitting

- Assisted in writing and editing a comprehensive review on transition metal boride, carbide, pnictide, and chalcogenide water oxidation electrocatalysts from over 890 peer-reviewed reports published from 2013 to 2022. Compiled a database of 900+ catalysts and designed a protocol for evaluating catalytic performance using *in situ/operando* characterization techniques.
- Employed statistical and machine learning methods to derive catalytic performance trends from experimental databases of water oxidation electrocatalysts.
- Extensive use of physical, chemical, and electrochemical characterization techniques.
- Synthesized and tested Ni-based pnictide and chalcogenide water-splitting electrocatalysts using 3D-printed electrochemical flow cells.

Electrochemical engineering and device prototyping

- Designed and built 12+ custom electrochemical cells for electrocatalyst testing, zero-gap water electrolysis, flow electrodeposition, real-time bubble visualization, and *in situ* Raman spectroscopy.
- Implemented laboratory automation strategies to accelerate the electrodeposition of catalytic films.
- Studied the impact of electrode architecture on bubble removal during water electrolysis *via* 3D printing.

Reinvigorating electrochemistry education

- Developed a comprehensive educational workshop for teaching concepts of electrochemical energy devices to high school and undergraduate students using active learning strategies.

Other collaborations

- Collaborated with Mexican researchers to use SU-101 MOF materials as cathodes in lithium-sulfur batteries.
- Developed protocols for calibrating reference electrodes and effectively implementing *iR* compensation

Visiting Scholar, The University of Texas at Austin

Sep. 2019 - Nov. 2019

Department of Chemistry | *Mullins Research Group*

- Characterized Pd and Ni catalysts deposited on Ni foam substrates for sulfite electrooxidation.
- Synthesized and tested nickel nitride and vanadium carbide water-splitting electrocatalysts.

Graduate Research Assistant, Universidad Autonoma de Chihuahua

Aug. 2018 - June 2020

Department of Chemistry | *Ramos Research Group*

- Designed and optimized an electrochemical flow reactor for sulfite ion electrooxidation and high-purity hydrogen production using simulated flue gas emissions.
- Designed and built 6+ electrochemical flow cells using affordable 3D printing materials.
- Investigated the hydrodynamics, flow distribution, and mass transfer of electrochemical flow cells using COMSOL Multiphysics simulations, tracer injection tests, and dimensional analysis.
- Studied the kinetics of sulfite ion electrooxidation on Pd electrocatalysts using a rotating disk electrode.

Undergraduate Research Assistant, Universidad Autonoma de Chihuahua

Aug. 2015 - June 2017

Department of Chemistry | *Ramos Research Group*

- Evaluated the performance of an electrochemical membrane reactor for the electrooxidation of sulfite ions using a design of experiments approach.
- Assisted in the simulation and optimization of a flue gas desulfurization plant incorporating a photochemical step to convert SO₂ into hydrogen and ammonium-based fertilizers.

Certifications**IOP Peer Review Excellence**, IOP Publishing

Oct. 2023

Certified by IOP Publishing as a trusted reviewer. Received training in peer review at the 244th ECS meeting in Gothenburg, Sweden.

Responsible Conduct of Research, Collaborative Institutional Training Initiative

Sep. 2020

Certified by the CITI Program. Received training on the norms, principles, regulations, and rules governing the practice of research.

Selected Presentations (Total: 10 Oral, 10 Posters)

Oral (*Invited):

- 244th ECS meeting**, Gothenburg, Sweden Oct. 2023
Understanding the Effects of Transition Metal Impurities on Nickel (oxy)hydroxide Electrocatalysts in Alkaline Media.
- *Electrochemistry Chalk Talks Series, UT-Austin ECS Chapter**, Austin, Texas Nov. 2023
Mastering the Art of Composing Scientific Graphics. [Recording](#)
- *Electrochemistry Chalk Talks Series, UT-Austin ECS Chapter**, Austin, Texas Apr. 2023
Understanding Electrochemical Double Layer Capacitance Measurements. [Recording](#)
- *Hispanic Engineers Leadership Series, AIChE Chapter at UANL**, Monterrey, Mexico Oct. 2022
Splitting Water with Electrons: Powering a Safer and Greener Future. Plenary Speaker.
- 2022 ChemE Future Faculty Diversity Seminar Series**, Zoom (Online) Sep. 2022
Taking the Next Step in Electrocatalysis: Closing Gaps Between Lab-scale Electrochemistry and Electrochemical Engineering.
- *Energy and Society Virtual Plenary Session, UABC**, Zoom (Online) Nov. 2020
Unraveling Electrochemical Water Splitting: Are Electrocatalysts Truly Stable? [Recording](#)
- *ECS Monthly Webinars Plenary Session, UT-Austin**, Zoom (Online) Jun. 2020
Hydrogen from Sulfite Electrolysis: Toward the Rational Design and Optimization of Practical Electrochemical Flow Cell Systems.
- 14th HYPOTHESIS International Symposium**, Foz do Iguaçu, Brazil Apr. 2019
Sulfur dioxide exploitation by electrochemical oxidation of sulfite in near-neutral pH via the Sulfur-Ammonia Cycle.
- 2017 AIChE Annual Meeting, AIChE**, Minneapolis, Minnesota Oct. 2017
Design of an Electrochemical Membrane Reactor for Hydrogen Production via the Sulfur-Ammonia Cycle.
- Young Researchers Symposium, CONACyT**, Guanajuato, Mexico Sep. 2016
Design of an Ion-Exchange Membrane Electrochemical Reactor for Hydrogen Production via the S-NH₃ Cycle

Posters:

- 2024 #RSCPoster competition**, LinkedIn (Online) Mar. 2024
Trace Metal Incorporation Through In Situ Cation Exchange: Effects on Energy Conversion and Storage Properties. Energy category award (1st place) and best #RSCPosterPitch award.
- 243rd ECS meeting with SOFC-XVIII**, Boston, Massachusetts May 2023
Six Practices to Improve Alkaline Electrolyte Preparation. General Student Poster Session award (1st place).
- 2023 CEC Annual Workshop on Electrochemistry, UT-Austin**, Austin, Texas Feb. 2023
Six Steps to Prepare Alkaline Electrolytes for Electrochemical Applications.
- LatinXChem 2022 Virtual Poster Session, LatinXChem**, Twitter (Online) Nov. 2022
Tailoring 3D-Printed Electrodes for Enhanced Water Splitting.
- 2021 ACS Southwest Regional Meeting Poster Session, ACS**, Austin, Texas Nov. 2021
Flow Cell-Assisted Electrodeposition of Ni-S-P-O Films on Nickel Foam for Electrochemical Water Splitting.
- LatinXChem 2021 Virtual Poster Session, LatinXChem**, Twitter (Online) Sep. 2021
Flow Cell-Assisted Electrodeposition of Ni-S-P-O Films on Nickel Foam for Electrochemical Water Splitting.
- 2020 CEC Annual Workshop on Electrochemistry, UT-Austin**, Austin, Texas Feb. 2020
Simultaneous sulfite electrooxidation and hydrogen production in a 3D-printed electrochemical reactor.
- 2019 CEC Annual Workshop on Electrochemistry, UT-Austin**, Austin, Texas Feb. 2019
Electrochemical Oxidation of Sulfite in Near-Neutral pH Electrolytes: A Kinetics Study.

- 2017 Annual AIChE Student Conference, AIChE, Minneapolis, Minnesota** Oct. 2017
Design of a Novel Electrochemical Membrane Reactor for Hydrogen Production via the Sulfur-Ammonia Water-Splitting Cycle. Harry West Student Poster Award (1st place).
- 2016 Green & Sustainable Chemistry Conference, Elsevier, Berlin, Germany** Apr. 2016
Design of an Ion-Exchange Membrane Electrochemical Reactor for Hydrogen Production via the S-NH₃ Cycle

Memberships and Affiliations

Member, Materials Horizons Community Board, The Royal Society of Chemistry	Oct. 2023 - Present
Secretary, UT-Austin ECS Student Chapter	Mar. 2023 - Present
Member, The Royal Society of Chemistry	Dec. 2023 - Present
Member, The American Institute of Chemical Engineers	Feb. 2023 - Present
Member, The Electrochemical Society	Sep. 2022 - Present
Member, Mexican Hydrogen Society	Sep. 2022 - Present
International Instructor and Ambassador, Clubes de Ciencia MX	Feb. 2022 - Present
Member, American Chemical Society	Oct. 2021 - Present
Young Leader, Mexican Youth Red Cross	Nov. 2009 - Dec. 2013

Work/Teaching Experience

Graduate Teaching Assistant, UT-Austin	Fall 2020 - Spring 2021
Taught Introduction to Chemical Practice, CH 204, in Fall 2020 and Spring 2021. Responsibilities included guiding students through introductory chemistry experiments, grading reports, leading online and laboratory sessions, preparing lectures, and holding office hours. Received two teaching awards from UT-Austin.	
GRS 097: Fundamentals for Teaching Assistants, UT-Austin	Fall 2020
Completed a semester-long pedagogy course for graduate teaching assistants to learn strategies including leading effective discussion sections, lesson-making strategies, and use of active learning activities.	
Research Assistant, Universidad Autonoma de Chihuahua	Aug. 2017 - Jun. 2018
Hired by Prof. Victor H. Ramos-Sanchez for a one-year position as a research assistant to conduct corrosion tests and passivation experiments on stainless steel in collaboration with KAT Aerospace and the Advanced Materials Research Center in Chihuahua, Mexico.	
Undergraduate Teaching Assistant, Universidad Autonoma de Chihuahua	Aug. 2017 - Jun. 2018
Assisted Prof. Victor H. Ramos-Sanchez in teaching undergraduate Physical Chemistry and graduate Instrumental Analysis courses for two semesters. Responsibilities included leading physical chemistry laboratory sessions, holding office hours, and grading coursework, presentations, exams, and final projects. Assisted in the development of 6+ laboratory experiments and lectures.	

Mentoring Experience

Chloe Williamson , Undergraduate student (chemical engineering), UT-Austin	Spring 2024 - Present
Thuy Vy Le , Undergraduate student (chemistry), UT-Austin	Fall 2023 - Present
Daniel Y. Ko , Undergraduate student (chemical engineering), UT-Austin	Fall 2023
Sergio Ochoa , Undergraduate student (chemical engineering), UACH	Fall 2023 - Present
Michael Espinosa , Undergraduate student (chemistry), UT-Austin	Spring 2023 - Present
Emma Kalokowski , Undergraduate student (chemistry), UT-Austin	Fall 2022 - Present
Grace Castellino , Undergraduate student (chemistry), UT-Austin	Spring 2022 - Fall 2022
Grayson Constantine , Undergraduate student (chemical engineering), UT-Austin	Fall 2021 - Spring 2022
Kenya Mora-Dominguez , M.S. student (chemistry), UACH	Fall 2020 - Summer 2022

Entrepreneurial Activities

Mentor, VirtAgro	Fall 2021
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Mentored and guided three undergraduate students, Mariella, Job, and Joel, in developing an intelligent sprinkler system controlled by a smartphone app and looking for potential customers through the business model canvas tool. Qualified as semifinalists for the *QuimInnova* Pitch Competition (Fall 2021).

Entrepreneurship, From Ideas to Businesses, UNAM/Santander Fall 2019

Trained in developing new skills and identifying the necessary tools for becoming a successful young entrepreneur. The course reviewed essential finances, markets, customers, benchmarking, marketing, human resources, and business model canvas.

Entrepreneur Leader, H24U Spring 2019

Participated as entrepreneur leader in developing an electrochemical system for ultra-pure hydrogen generation (H24U). I was trained in the *I-Corps* program of the US National Science Foundation (NSF) to determine the commercial viability of the technology. The program was funded by the CONACyT (Mexico) and the NSF (United States) as part of the Northwest Binational Innovation Node (NoBI Noroeste). Over 130 potential customers were interviewed, a business model canvas was developed, and a potential market was identified.

Science Communication

Catalastic! YouTube Channel Summer 2023

Personal project to advance science communication through social media. [Link](#)

Bright Spikes! Electrifying Chemical Reactions, Clubes de Ciencia MX / ITESM Summer 2023

Participated as the leading instructor of a science summer club organized by Clubes de Ciencia MX, ITESM, and CIMAV. Taught five sessions about electrochemistry concepts and electrocatalysis, with four laboratory sessions. Over 15 students learned to make an inexpensive potentiostat with Arduino and LabVIEW.

Electrochemistry: How Do We Transport Energy? Clubes de Ciencia MX / ITESM Summer 2022

Participated as the leading instructor of a science summer club organized by Clubes de Ciencia MX, ITESM, and UANL. Taught five sessions about electrochemical energy devices and materials chemistry, with four laboratory sessions. Over 20 students constructed and tested water electrolyzers, fuel cells, and batteries.

Quantum Chemistry for Kids, UACH Summer 2019

Developed a 3D-printed interactive game for teaching atomic structure concepts to elementary school students, as part of the Graduate Quantum Chemistry course imparted by Dr. Maria Elena Fuentes. Over 20 students were taught in two sessions. The school received four 3D-printed, interactive boards.

From Photons to Electrons, Clubes de Ciencia MX / ITESM Summer 2018

Participated as a guest instructor of a science summer club organized by Clubes de Ciencia MX, ITESM, and UACH. Taught two sessions about dye-sensitized solar cells and solar panels made by the students. Over 30 students learned how to make inexpensive solar cells and characterize their electrochemical performance.

Science Podcasts and Talk Shows, UACH Summer 2016

Participated as a guest speaker at UACH's radio station for podcasting science topics about chemistry in daily life. Over 50 science topics were recorded, edited, and broadcasted in 2016, impacting 1000+ listeners.

Volunteering

Secretary, UT-Austin ECS Student Chapter Mar. 2023 - Present

Started a series of Chalk Talks in electrochemistry for the local ECS Student Chapter. Developed an official website and managed all the chapter's social media accounts. Served as the chapter's photographer for academic and outreach activities. Recorded and edited seminar recordings for posting on the chapter's YouTube channel. Coordinated social events and one academic seminar for the regional Texas ECS Section.

Graduate Recruiter and Student Host, Department of Chemistry, UT-Austin Spring 2021 – Present

Hosted eight visiting students and served as staff during recruitment events. Held six seminars at the top five national universities in Mexico, explaining the application process for the Fall 2023 period, and engaged with over 30 students through both face-to-face and online conversations. Guided seven students through their

application process. Held ten Zoom sessions to help four prospective international students enhance their English skills and prepare for the TOEFL and IELTS exams. Received two service awards from the department.

Minor leader, Mexican Youth Red Cross at Chihuahua Nov. 2009 - Dec. 2013

Served as a part-time Mexican Youth Red Cross volunteer, a nonprofit and charity association. Received training in first-aid, CPR, advanced burn life support, humanitarian aid, disaster relief, health and safety campaigns, sexual education, and sport promotion activities. Participated in over 40 community service and humanitarian relief activities and three major disaster operations (earthquakes and snowstorms). Received rope rescue training and became an instructor. Co-author of a comprehensive handbook on rope rescue for the Mexican Youth Red Cross. Coordinated twelve operations as leader of the Health and Life Protection branch at the Mexican Youth Red Cross office in Chihuahua, impacting over 120 people in need.

Skills and Abilities

Strong Personal Skills: Creativity, systems thinking, motivation, resilience, flexibility, oral communication, written communication, teamwork, leadership, interpersonal thinking, emotional intelligence, and self-awareness.

Instrumental Analysis: Scanning and transmission electron microscopy, X-ray diffraction, non-contact profilometry, infrared spectroscopy, UV-vis spectroscopy, Raman spectroscopy, total-reflectance X-ray fluorescence, electroanalytical techniques, gas chromatography, inductively coupled plasma mass spectrometry, contact angle measurements, ion beam milling, sputter coaters, tube furnaces, microwave digestion systems, thermogravimetric analysis, and differential scanning calorimetry. Demonstrated experience developing standard analytical procedures for electrochemical detection, total-reflectance X-ray fluorescence, gas chromatography, and inductively coupled plasma mass spectrometry.

Specialized Software: SolidWorks, Origin, Minitab, Gamry Echem Analyst, ZView, ImageJ, CasaXPS, Gatan Microscopy Suite, COMSOL Multiphysics, LabVIEW, Arduino, HyperSpy, Match, Diamond, Fityk, Maple, MATLAB, Zotero Reference Management, Microsoft Office.

Digital Editing Software: Inkscape, Adobe Illustrator, Adobe Premiere Pro, Adobe Animate, Adobe Photoshop, GIMP, Blender.

Languages: English (professional working proficiency), Spanish (native proficiency).

Music: Guitar.

Other Skills: Avid outdoorsman. Passionate about science communication, podcasting, photography, video and audio editing, graphic design, and 2D/3D animation.