

Raul A. Marquez

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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, <i>Cum Laude</i> Academic Honor	GPA 4.0
Advisor: Prof. Víctor Hugo Ramos-Sánchez, Renewable Energy subgroup.	
<u>Thesis</u> : "Evaluating and Optimizing Sulfite Electrooxidation in a Parallel-plate Reactor"	
Universidad Autonoma de Chihuahua	August 2012 – November 2017
B.S. Chemical Engineering, <i>Cum Laude</i> Academic Honor	GPA 4.0
Advisor: Prof. Víctor Hugo Ramos-Sánchez, Renewable Energy subgroup.	
<u>Thesis</u> : "Design of an Electrochemical Membrane Reactor for Hydrogen Production via the Hybrid Thermochemical Sulfur-Ammonia Cycle"	

Publications (First-author: 12, Co-authored: 12, h-index: 11, Citations – Aug. 2024: 494)

Completed at UT-Austin.

24. 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. *J. Chem. Educ.* **2024**, In Press. [Link](#)
23. Smith, L.A., Kawashima, K., Marquez, R.A., Mullins, C.B. A Perspective on Protective Carbon Shells for Improved Stability of Alkaline Water Oxidation Electrocatalysts. *ACS Materials Lett.* **2024**, 6, 3190–3201. [Link](#)
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. *Journal of Materials Chemistry A.* **2024**, In Press. [Link](#)
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. *ACS Materials Lett.* **2024**, 6, 7, 2905–2918. [Link](#)
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](#)

Awards and Recognition

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
CATL-ChemCatBio Graduate Student Travel Award, The American Chemical Society	Aug. 2024
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, The Electrochemical Society	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	July. 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

Funding / Grants

International Doctoral Fellowship Program , CONAHCyT / ConTex	Aug. 2021 – Aug. 2025
<i>Proposal: 3D printing Approaches for Electrochemical Water Splitting: Incorporating Advanced Features into Educational Water Electrolysis Technologies</i>	
Graduate Research Fellowship US\$132,000 for over four years	
Provost's Graduate Excellence Fellowship , The University of Texas at Austin	Sep. 2020 – Aug. 2025
Graduate Research Fellowship US\$130,000 for over five years (in addition to teaching and research assistantships)	
Edward G. Weston Summer Fellowship , The Electrochemical Society	Summer 2024
<i>Proposal: Understanding the Effects of Intermittent Water Electrolysis on Transition Metal (Oxy)hydroxide Oxygen Evolution Electrocatalysts</i>	
Research Fellowship US\$5,000	

Travel Awards

CATL-ChemCatBio Graduate Student Travel Award , The American Chemical Society	Aug. 2024
Professional Development Travel Award , Chemistry Department, UT-Austin	Aug. 2024
Center for Electrochemistry Travel Grant , Center for Electrochemistry at UT-Austin	May 2024
ECS Texas Section Travel Award (244th ECS Meeting) , The Electrochemical Society	Oct. 2023
ECS Texas Section Travel Award (243rd ECS Meeting) , The Electrochemical Society	May 2023
Totaling US\$1,800	

Certifications

IOP Peer Review Excellence , IOP Publishing	Oct. 2023
Certified by IOP Publishing as a trusted reviewer. Received training in peer review at the 244 th 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: 12 Oral, 10 Posters)**Oral (*Invited):**

245th ECS meeting , San Francisco, California	May 2024
<i>Dynamic Activity and Stability of Transition Metal (oxy)Hydroxide Oxygen Evolution Electrocatalysts Under Steady and Intermittent Operation.</i>	
244th ECS meeting , Gothenburg, Sweden	Oct. 2023
<i>Understanding the Effects of Transition Metal Impurities on Nickel (oxy)hydroxide Electrocatalysts.</i>	
*Electrochemistry Chalk Talks Series, UT-Austin ECS Chapter , Austin, Texas	Nov. 2023
<i>Mastering the Art of Composing Scientific Graphics.</i> Recording	
Chemistry Recruitment 2023 , UNAM / UAM / IPN / UANL, Mexico City, Mexico	Sep. 2023
<i>The Road to Grad School. A Guide to Joining the PhD Program in Chemistry.</i>	
*Fall Seminar Series, Chemistry Department at UNAM , Mexico City, Mexico	Sep. 2023
<i>The Devil is in the Impurities: Understanding the Influence of Transition Metal Impurities.</i>	
*Electrochemistry Chalk Talks Series, UT-Austin ECS Chapter , Austin, Texas	Apr. 2023
<i>Understanding Electrochemical Double Layer Capacitance Measurements.</i> Recording	
*Hispanic Engineers Leadership Series, AIChE Chapter at UANL , Monterrey, Mexico	Oct. 2022
<i>Splitting Water with Electrons: Powering a Safer and Greener Future.</i> Plenary Speaker.	
2022 ChemE Future Faculty Diversity Seminar Series , Zoom (Online)	Sep. 2022
<i>Taking the Next Step in Electrocatalysis: Closing Gaps Between Lab-scale Electrochemistry and Electrochemical Engineering.</i>	
*Energy and Society Virtual Plenary Session , UABC, Zoom (Online)	Nov. 2020
<i>Unraveling Electrochemical Water Splitting: Are Electrocatalysts Truly Stable?</i> Recording	
*ECS Monthly Webinars Plenary Session , UT-Austin, Zoom (Online)	Jun. 2020
<i>Hydrogen from Sulfite Electrolysis: Toward the Rational Design and Optimization of Practical Electrochemical Flow Cell Systems.</i>	
14th HYPOTHESIS International Symposium , Foz do Iguaçu, Brazil	Apr. 2019
<i>Sulfur dioxide exploitation by electrochemical oxidation of sulfite in near-neutral pH via the S-NH₃ Cycle.</i>	
2017 AIChE Annual Meeting , AIChE, Minneapolis, Minnesota	Oct. 2017
<i>Design of an Electrochemical Membrane Reactor for Hydrogen Production via the Sulfur-Ammonia Cycle.</i>	
Young Researchers Symposium , CONACyT, Guanajuato, Mexico	Sep. 2016
<i>Design of an Ion-Exchange Membrane Electrochemical Reactor for Hydrogen Production via the S-NH₃ Cycle</i>	

Posters:

245th ECS meeting , San Francisco, California	May 2024
<i>A Guide to Electrocatalyst Stability Using Lab-Scale Alkaline Water Electrolyzers.</i>	
2024 #RSCPoster competition , LinkedIn (Online)	Mar. 2024
<i>Trace Metal Incorporation Through In Situ Cation Exchange: Effects on Energy Conversion and Storage Properties.</i> Energy category award (1 st place) and best #RSCPosterPitch award.	
243rd ECS meeting with SOFC-XVIII , Boston, Massachusetts	May 2023
<i>Six Practices to Improve Alkaline Electrolyte Preparation.</i> General Student Poster Session award (1 st place).	
2023 CEC Annual Workshop on Electrochemistry, UT-Austin , Austin, Texas	Feb. 2023
<i>Six Steps to Prepare Alkaline Electrolytes for Electrochemical Applications.</i>	
LatinXChem 2022 Virtual Poster Session, LatinXChem , Twitter (Online)	Nov. 2022
<i>Tailoring 3D-Printed Electrodes for Enhanced Water Splitting.</i>	
2021 ACS Southwest Regional Meeting Poster Session, ACS , Austin, Texas	Nov. 2021
<i>Flow Cell-Assisted Electrodeposition of Ni-S-P-O Films on Nickel Foam for Electrochemical Water Splitting.</i>	
LatinXChem 2021 Virtual Poster Session, LatinXChem , Twitter (Online)	Sep. 2021
<i>Flow Cell-Assisted Electrodeposition of Ni-S-P-O Films on Nickel Foam for Electrochemical Water Splitting.</i>	
2020 CEC Annual Workshop on Electrochemistry, UT-Austin , Austin, Texas	Feb. 2020
<i>Simultaneous sulfite electrooxidation and hydrogen production in a 3D-printed electrochemical reactor.</i>	
2019 CEC Annual Workshop on Electrochemistry, UT-Austin , Austin, Texas	Feb. 2019
<i>Electrochemical Oxidation of Sulfite in Near-Neutral pH Electrolytes: A Kinetics Study.</i>	
2017 Annual AIChE Student Conference, AIChE , Minneapolis, Minnesota	Oct. 2017
<i>Design of a Novel Electrochemical Membrane Reactor for Hydrogen Production via the Sulfur-Ammonia Water-Splitting Cycle.</i> Harry West Student Poster Award (1 st place).	
2016 Green & Sustainable Chemistry Conference, Elsevier , Berlin, Germany	Apr. 2016
<i>Design of an Ion-Exchange Membrane Electrochemical Reactor for Hydrogen Production via the S-NH₃ Cycle</i>	

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

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.

- 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.

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.

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. Responsibilities included leading laboratory sessions, holding office hours, and grading coursework. Assisted in the development of 6+ laboratory experiments and lectures.

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.

Young 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.

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

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. Fifteen 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.

Skills and Abilities

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

Instrumental Analysis and Methods: Scanning and transmission electron microscopy, X-ray diffraction, X-ray photoelectron spectroscopy, non-contact profilometry, infrared spectroscopy, UV-vis spectroscopy, Raman spectroscopy, total-reflectance X-ray fluorescence (TXRF), electroanalytical techniques, gas chromatography, inductively coupled plasma mass spectrometry (ICP-MS), 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, TXRF, gas chromatography, and ICP-MS.

Specialized Software: SolidWorks, Origin, Minitab, Gamry Echem Analyst, ZView, ImageJ, CasaXPS, Gatan Microscopy Suite, COMSOL Multiphysics, LabVIEW, Arduino, HyperSpy, Match, Diamond, 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.