

¿A dónde van nuestros egresados?

Ciencias del Espacio



Dra. Dionne Hernández
NASA

Dra. Marisabel Lebrón
NASA

Medicina



Dr. Francisco Merced
Cardiología

Dra. Yamilka Abreu
Gastroenterología

Dr. Héctor Meléndez
Infectología

Academia



Dra. Yamixa Delgado
Escuela de Medicina
San Juan Bautista

Dra. Lorell Muñoz
UPR-Rio Piedras

Farmacia



Lcda. Stephanie Luquis

Lcda. Kiara Santiago

Lcda. Raiza Santiago

Industria



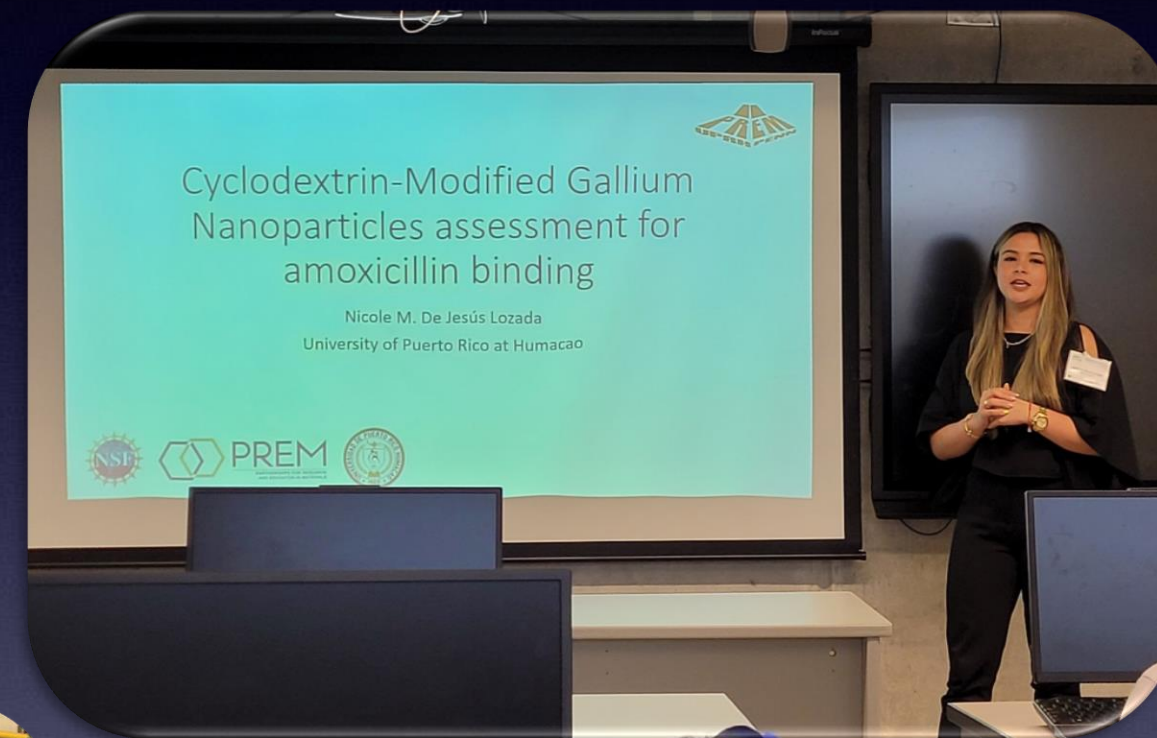
José Ortiz, BS, MBA
AMGEN

Damián Bigio, BS
Kenvue, NJ

José Ortiz, PhD
Organon, NJ

Junior Technical Meeting 2023

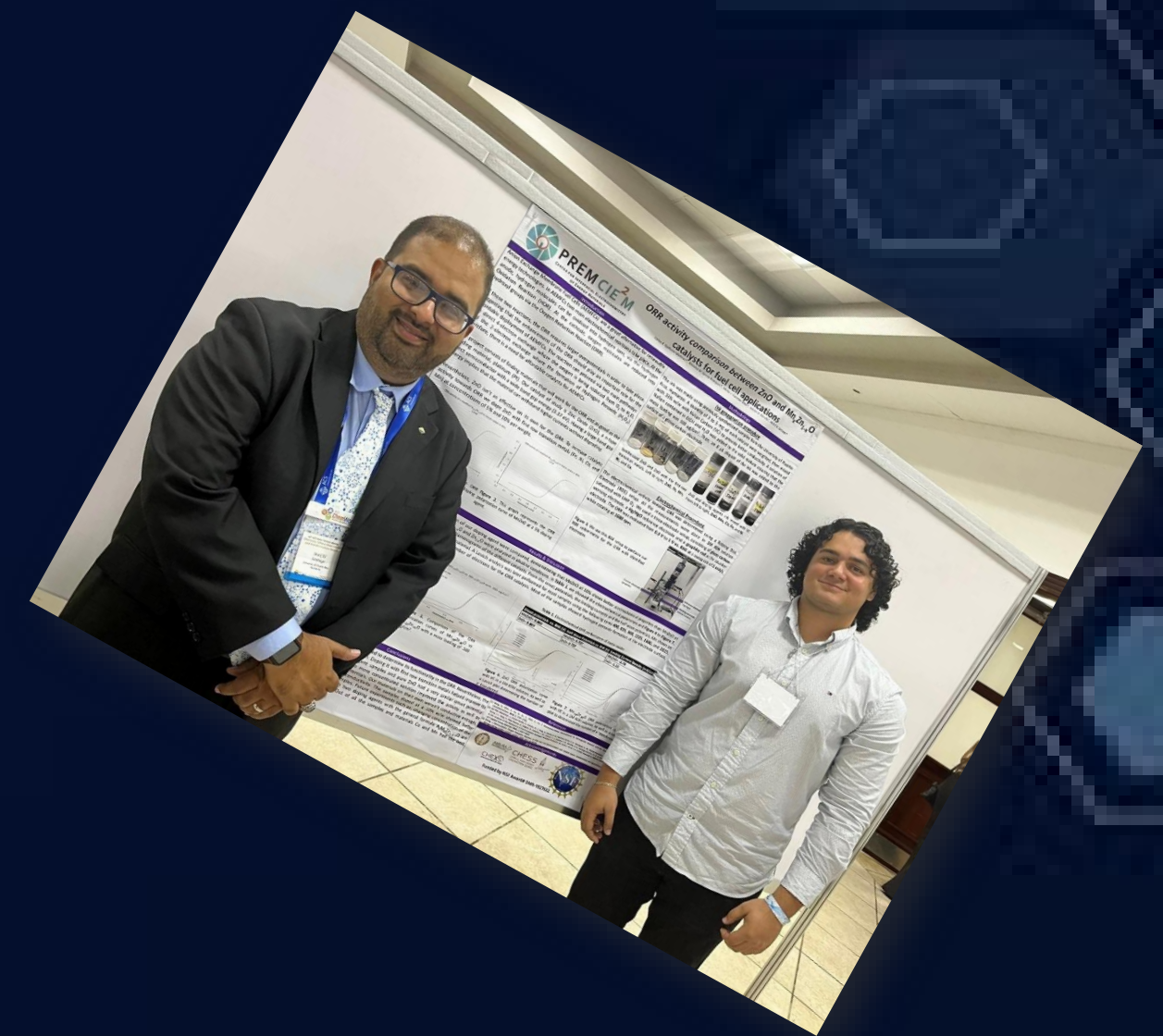
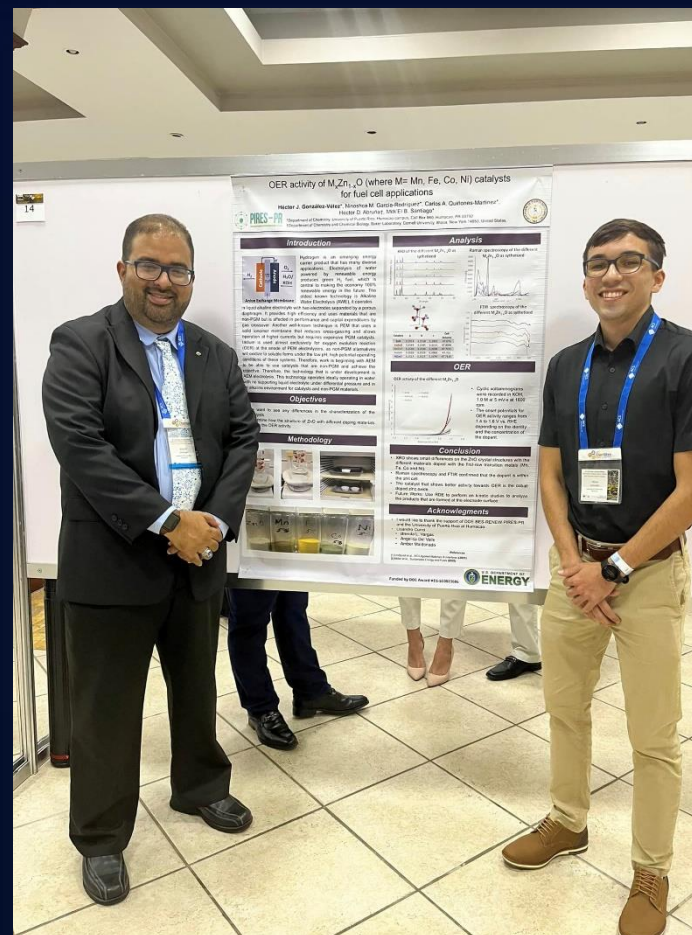
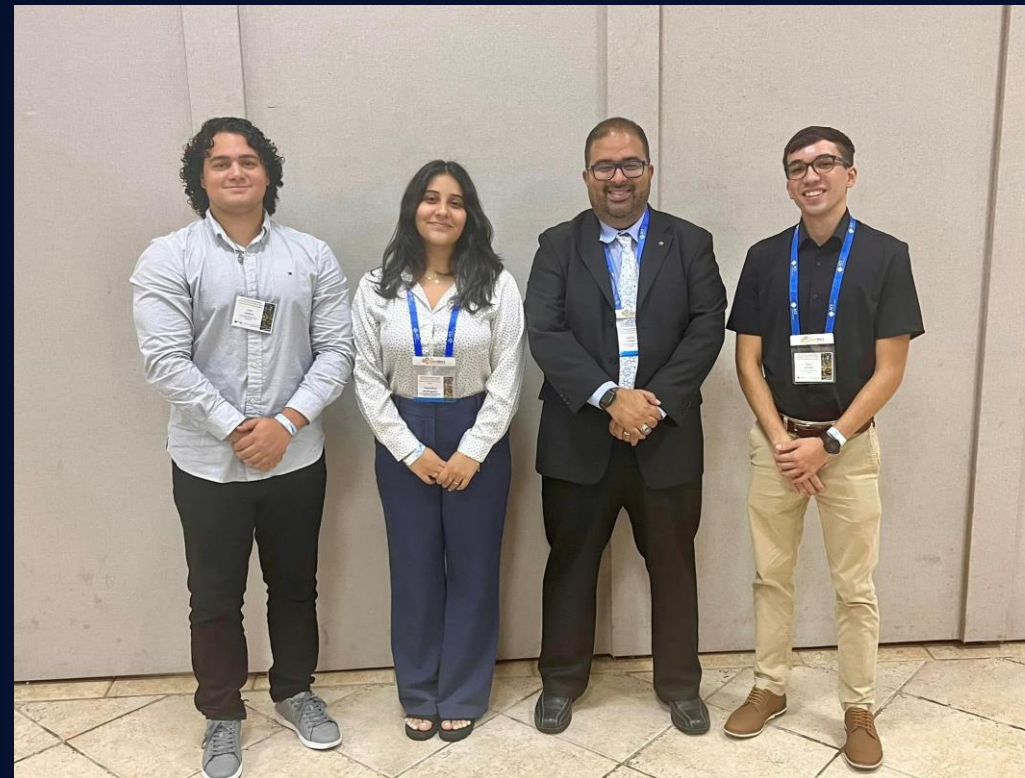
Estudiantes y facultad del Departamento de Química de UPRH participaron del "41st Puerto Rico Interdisciplinary Scientific Meeting (PRISM) & 56th ACS Junior Technical Meeting" en la UPR de Bayamón.



Buho's Horror Night



Estudiantes del Dr. Mitk'El B. Santiago presentaron sus trabajos de investigación en el 46th ACS Senior Technical meeting





Internados de Verano Realizados por Estudiantes del Departamento de Química.

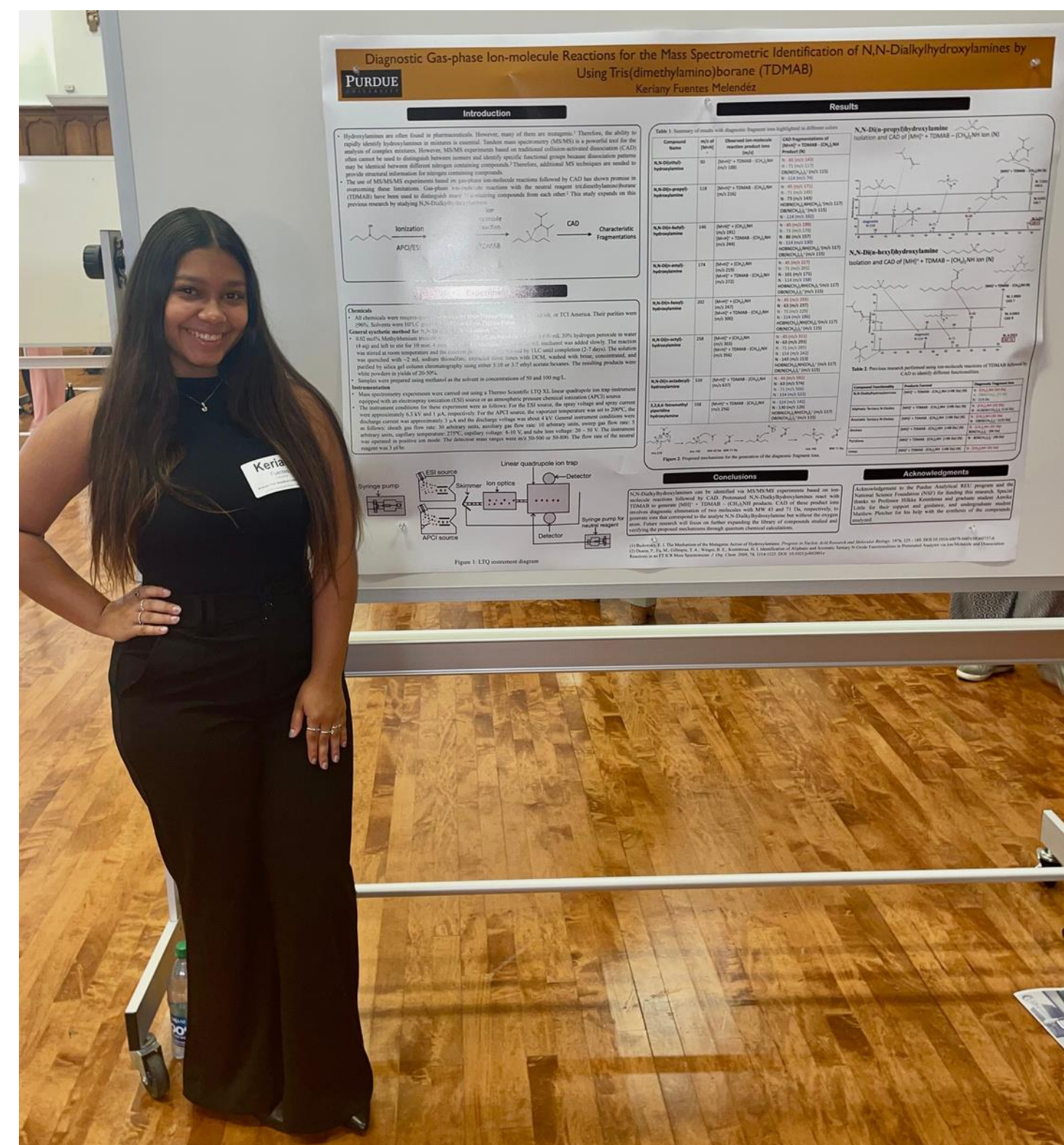
VERANO 2023



Keriany Fuentes Meléndez

Diagnostic Gas-phase Ion-molecule Reactions for the Mass Spectrometric Identification of N,N-Dialkylhydroxylamines Using Tris(dimethylamino)borane (TDMAB)

Purdue University, West Lafayette, IN





Karla C. López Meléndez

Extract from The Natural Product
Repository of The National Cancer
Institute.

The Ohio State University, College of
Pharmacy





Roberto Vaquero

Microfluidics for droplet generation

University of Pennsylvania

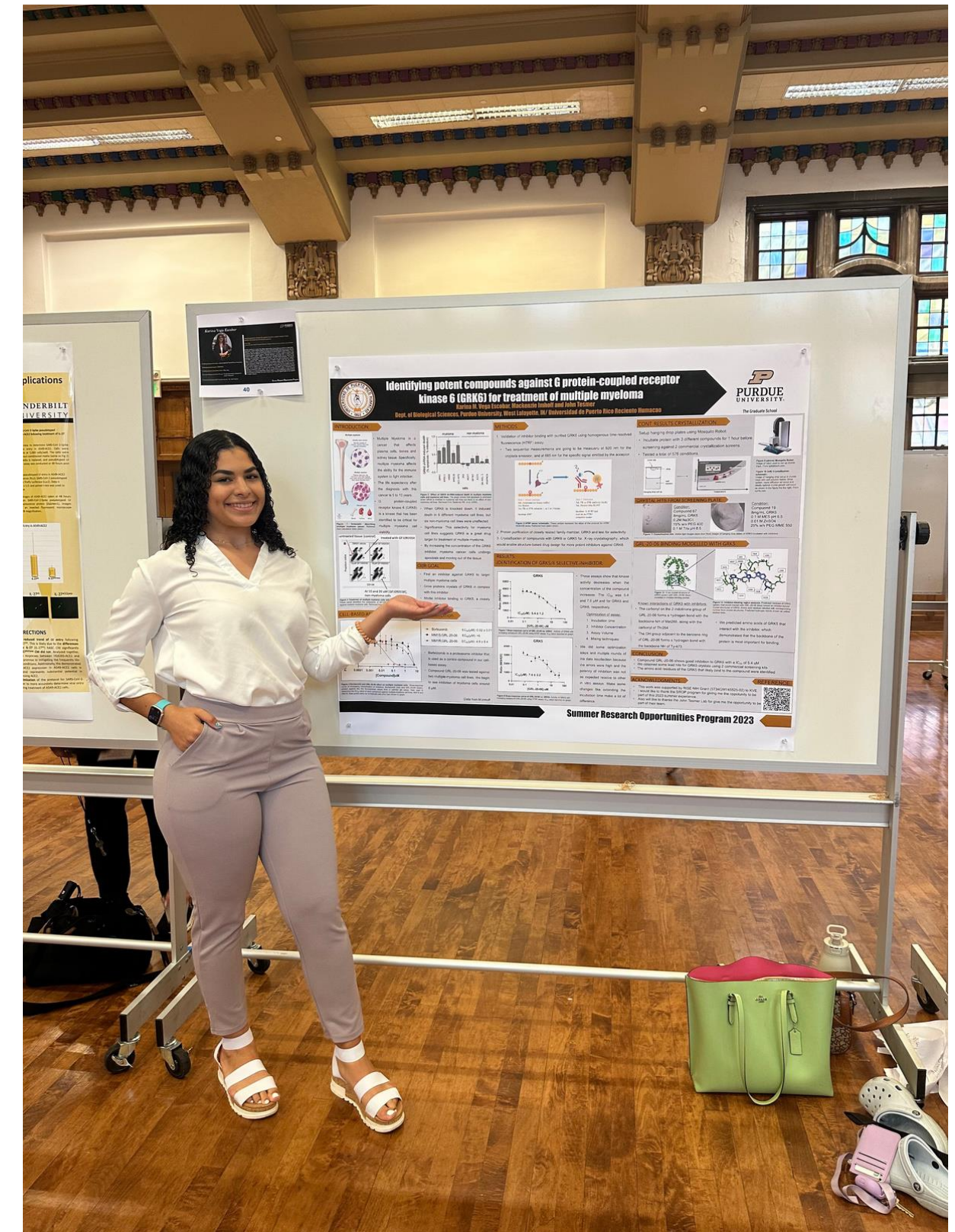




Karina Vega Escobar

Identifying potent compounds against & protein-coupled receptor kinase 6 (GRK6) for treatment of multiple myeloma

Purdue University





Paola N. Del Pozo

Preparation of polymer nanocomposites
through novel capillary rise infiltration
methods

University of Pennsylvania

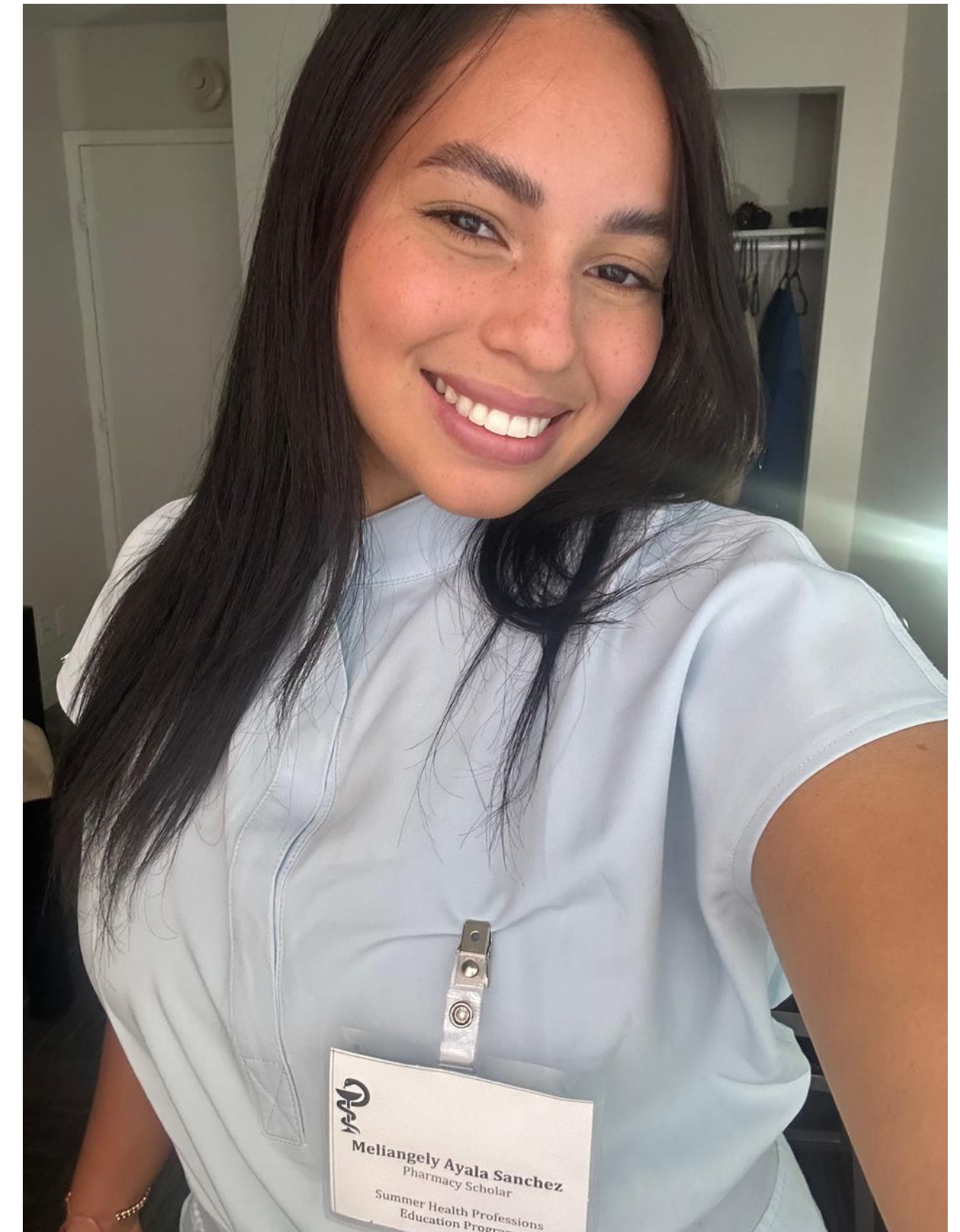




Meliangely Ayala Sánchez

Este internado estaba dirigido a distintos campos de la salud como medicina, farmacia, enfermería y dentista. Mi campo fue Farmacia y realicé "shadowings", "clinical rotations", seminarios, estuve en hospitales, realicé prueba de INR a pacientes, realicé presentaciones de investigaciones cortas y viví distintas experiencias de un farmacéutico que hicieron que me enamorara aún más de este campo.

Howard University, Washington D.C.

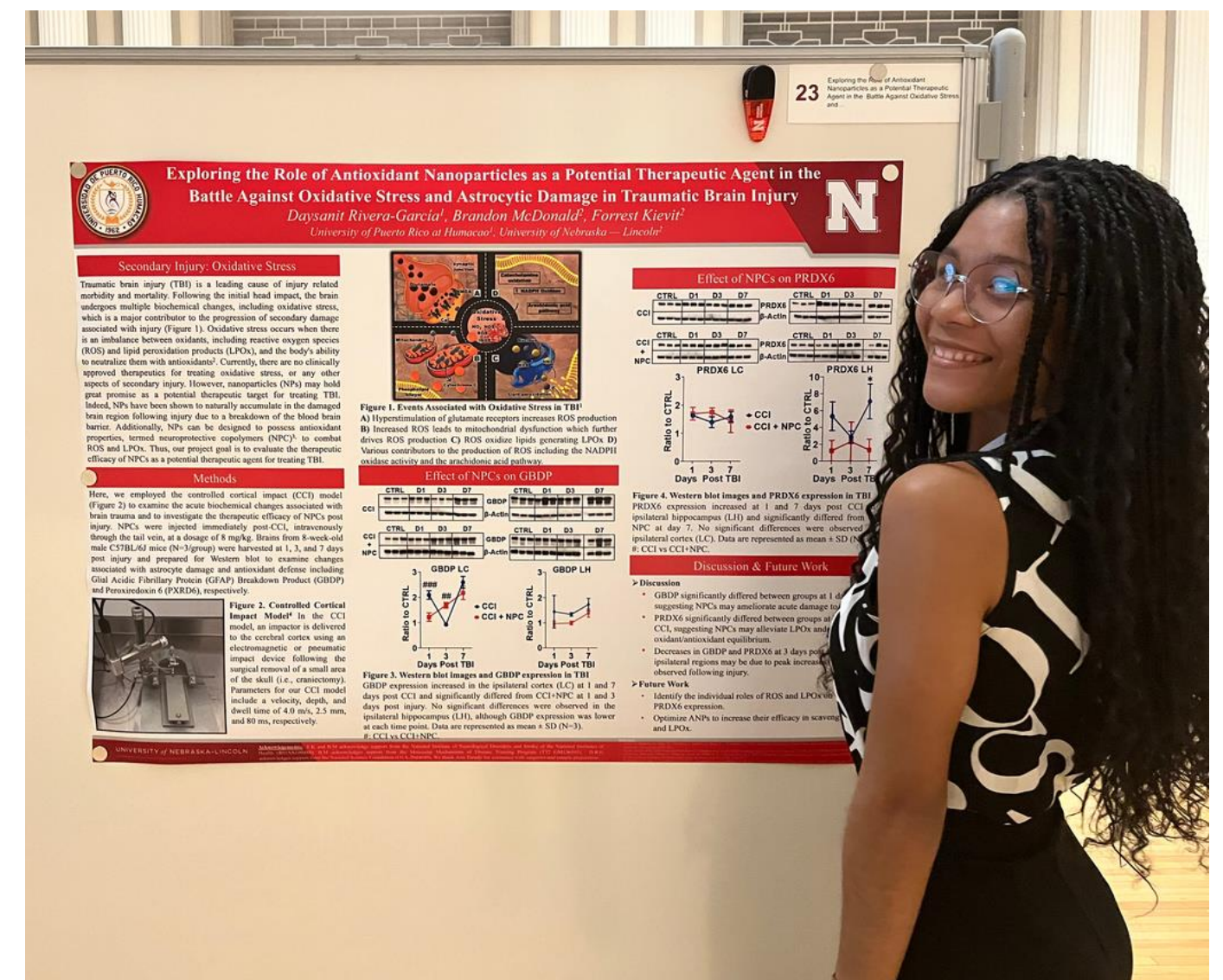




Daysanit Rivera García

Exploring the Role of Antioxidant Nanoparticles as a Potential Therapeutic Agent in the Battle Against Oxidative Stress and Astrocytic Damage in Traumatic Brain Injury

University of Nebraska-Lincoln





Grace M. Sánchez Santiago

Ciencia de materiales, infiltración de polímeros.

University of Pennsylvania





Yildeliz Díaz Cruz

Dispositivos microfluídicos impresos en 3D

University of Pennsylvania

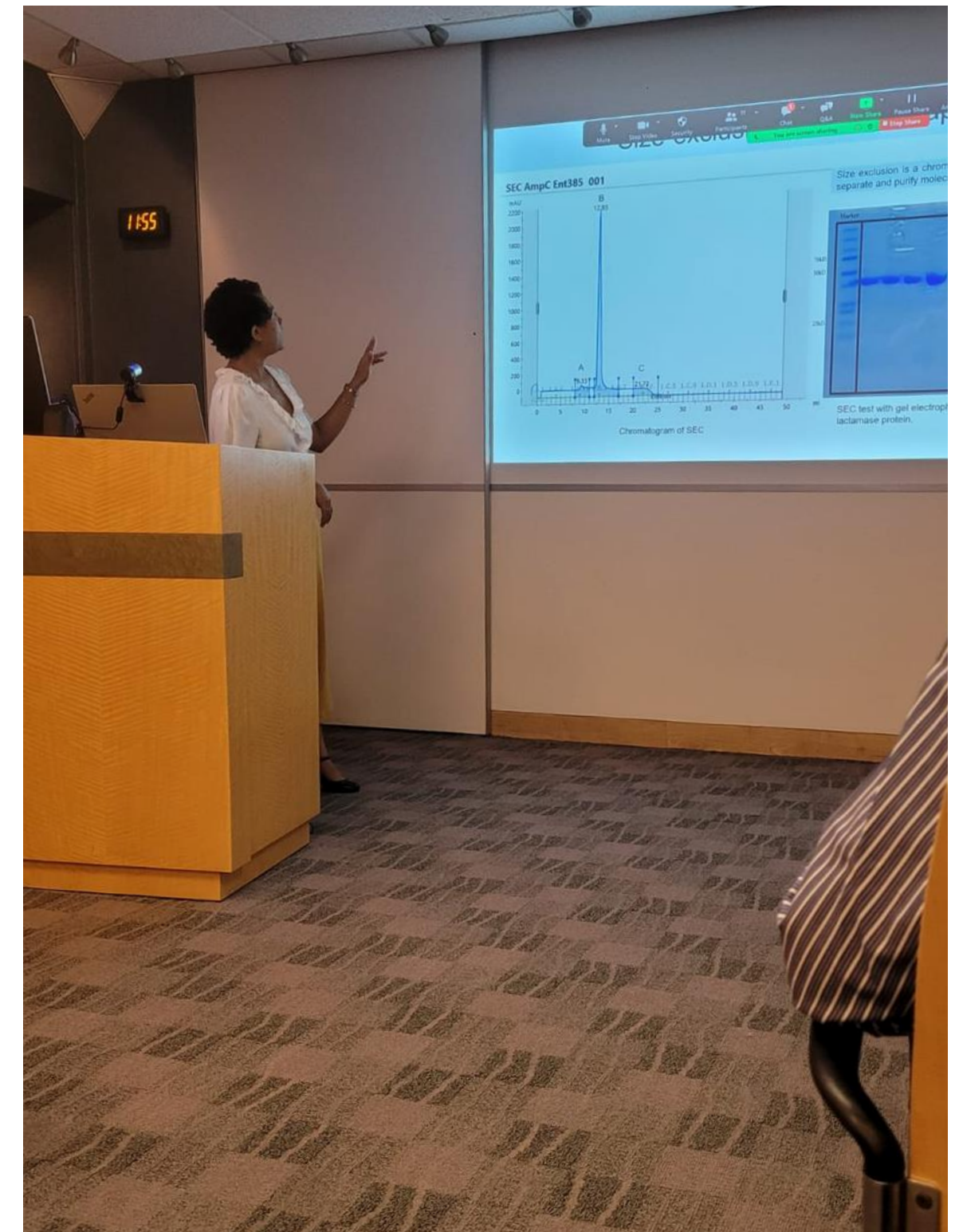




Johanney Esquilín Torres

Over-expression, purification, and crystallization of an AmpC β -lactamase from an *Enterobacter cloacae* clinical strain resistant to carbapenem antibiotics

Universidad de Pittsburgh





Carlos G. Agosto Alicea

Palladium-catalyzed N-vinyl Difunctionalization
Reactions for the Synthesis of Boc-Protected
Pyrrolidine Derivatives

University of Michigan

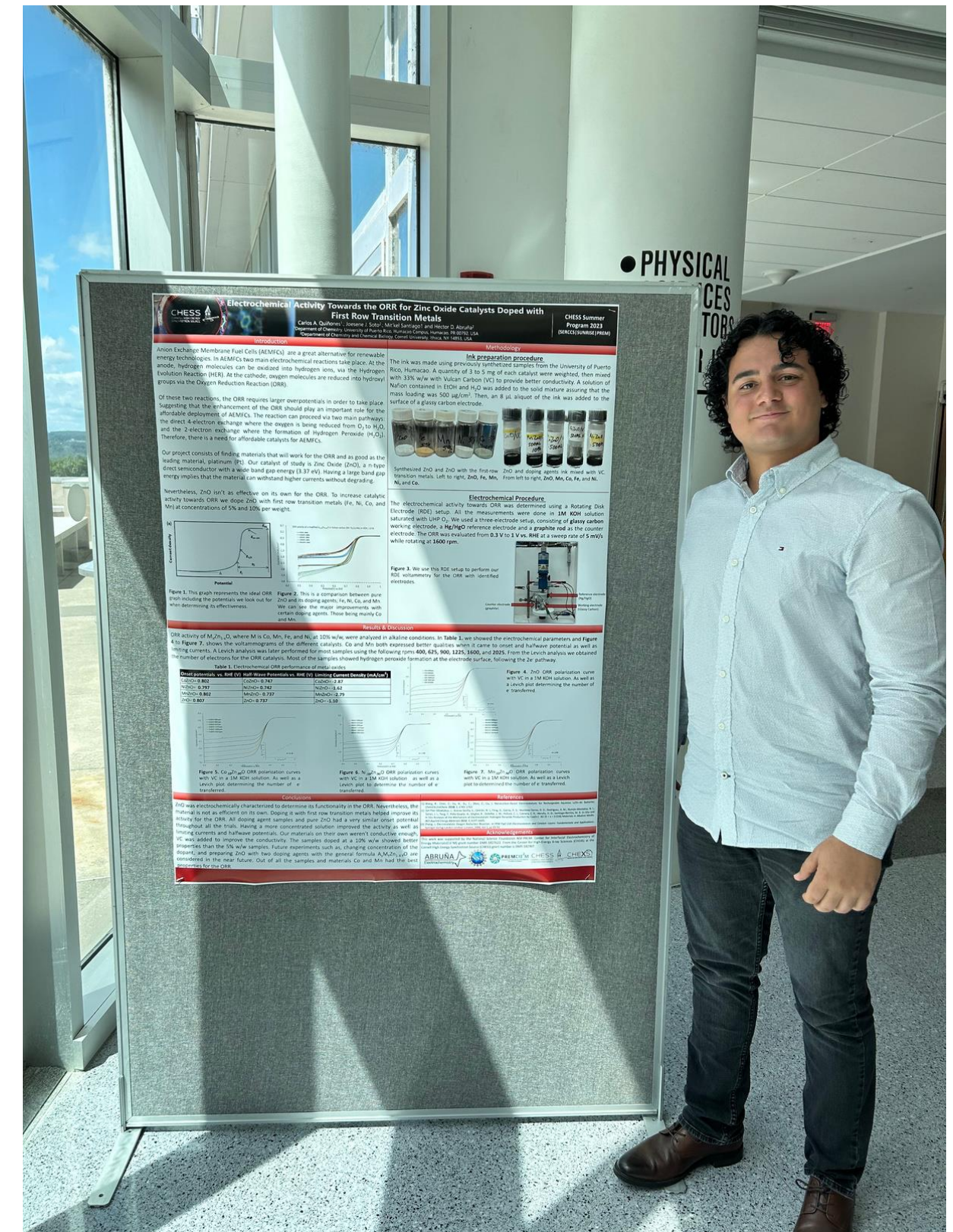




Carlos A. Quiñones Martínez

Propiedades Electroquímicas de ZnO en la Reacción de Reducción de Oxígeno (ORR)

Cornell University



Electrochemical Activity Towards the ORR for Zinc Oxide Catalysts Doped with First Row Transition Metals

Carlos A. Quiñones Martínez, Victor J. Soto, Michel Saragaglia, and Victor O. Anibal
Department of Chemistry, Cornell University, Ithaca, New York, USA

Abstract: Anion Exchange Membrane Fuel Cells (AEMFCs) are a great alternative for renewable energy technologies. In AEMFCs two main electrochemical reactions take place: at the anode, hydrogen molecules can be oxidized into hydrogen ions, via the Hydrogen Oxidation Reaction (HOR); at the cathode, oxygen molecules are reduced into hydroxide ions via the Oxygen Reduction Reaction (ORR). Of these two reactions, the ORR requires larger overpotentials in order to take place, suggesting that the improvement of the ORR should play an important role for the affordable deployment of AEMFCs. The reaction can proceed via two pathways: the direct 4-electron pathway where the oxygen is being reduced from O₂ to H₂O and the 2-electron pathway where the formation of Hydrogen Peroxide (H₂O₂) occurs. Therefore, there is a need for affordable catalysts for AEMFCs.

Our project consists of finding materials that will work for the ORR and as good as the leading material, platinum (Pt). Our catalyst of study is Zinc Oxide (ZnO), a n-type direct semiconductor with a wide band gap energy (3.37 eV). Having a large band gap energy implies that the material can withstand higher currents without degrading.

Nevertheless, ZnO isn't as effective on its own for the ORR. To increase catalytic activity towards ORR we doped ZnO with first row transition metals (Fe, Ni, Co, Cu, and Mn) at concentrations of 5% and 10% per weight.

Figure 1. This graph represents the ideal ORR. Figure 2. This is a comparison between pure ZnO and ZnO doped with Fe, Ni, Co, Cu, and Mn. We can see the major improvements with certain doping agents. These being mostly Co and Mn.

Table 1. Electrochemical ORR performance of materials.

Material	Half Cell ORR Half Potentials vs. RHE (V)	Current Density (mA/cm ²)
ZnO	0.89	0.07
ZnO-5.9%	0.92	0.43
ZnO-5.8%	0.92	0.29
ZnO-8.8%	0.93	0.38

ORR activity of M₂Zn_{1-x}O, where M is Co, Mn, Fe, and Ni, at 10% wt, were studied in alkaline conditions. In Table 1, we showed the electrochemical parameters and Figure 4-7 shows the voltammograms of the different catalysts. Co and Mn both expressed better qualities when it came to current and halfwave potential, as well as rising currents. A kinetic analysis was later performed for our samples using the following rates: 600, 825, 900, 1225, 1500, and 2025. From the kinetic analysis we obtained the number of electrons for the ORR catalysts. Most of the samples showed hydrogen peroxide formation at the electrode surface, following the 2e pathway.

Table 2. Electrochemical ORR performance of materials.

Material	Half Cell ORR Half Potentials vs. RHE (V)	Current Density (mA/cm ²)
ZnO	0.89	0.07
ZnO-5.9%	0.92	0.43
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ZnO-8.8%	0.93	0.38

Figure 3. Co₂Zn_{0.98}O ORR polarization curves with 10% in 1M KOH solution. As well as a Levich plot determining the number of e transferred.

Figure 4. ZnO ORR polarization curves with 10% in 1M KOH solution. As well as a Levich plot determining the number of e transferred.

Figure 5. Ni₂Zn_{0.98}O ORR polarization curves with 10% in 1M KOH solution. As well as a Levich plot determining the number of e transferred.

Figure 6. Mn₂Zn_{0.98}O ORR polarization curves with 10% in 1M KOH solution. As well as a Levich plot determining the number of e transferred.

This work was electrochemically characterized to determine its functionality in the ORR. Nevertheless, the material is not as efficient on its own. Doping it with first row transition metals helped improve its activity for the ORR. All doping agents samples and pure ZnO had a very similar onset potential throughout all the trials. Having a more concentrated solution improved the activity as well as rising currents and halfwave potentials. Our materials on their own weren't constructed enough. We added to improve the conductivity. The samples doped at a 10% wt showed better properties than the 5% wt samples. Future experiments such as, changing concentrations of the dopant, and preparing ZnO with two doping agents with the general formula AM₂Zn_{1-x}O are considered in the near future. Out of all the samples and materials Co and Mn had the best results for the ORR.

References: 1. A. J. Bard and L. R. Faulkner, Electrochemical Methods: Fundamentals and Applications, Wiley, New York, 2001. 2. J. Wang, Y. Wang, and J. Wang, Electrochim. Acta, 199, 1000-1005 (2006). 3. J. Wang, Y. Wang, and J. Wang, Electrochim. Acta, 199, 1000-1005 (2006). 4. J. Wang, Y. Wang, and J. Wang, Electrochim. Acta, 199, 1000-1005 (2006).

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ACKNOWLEDGMENTS: We thank the CHESS Summer Program 2023 for providing the facilities and equipment for this research.



Yelisbeth Santa Villafañe

Impact of Polarization Time on Nitric Oxide Sensor Performance

The University of North Carolina at Chapel Hill





CASA ABIERTA 2022