Lisandra Arroyo-Ramírez, PhD

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SUMMARY OF QUALIFICATIONS

Research chemist with expertise in experimental process and instrumentation used in analytical chemistry, chemical engineering, electrochemistry, nanotechnology, materials and surface science.

- **Excellent communications skills**, as proved by *17 peer-reviewed publications* and over *60 presentations* at national and international conferences and scientific events. **Bilingual** (English/***Spanish***)
- Demonstrated success in preparing/giving *workshops and presentations for diverse audiences*, and team player with proven leadership in training and supervising students.
- **12+ years of hands-on experience developing experimental procedures** for the synthesis of nanomaterials by chemical and physical methods and characterization with analytical, microscopy and spectroscopy techniques.
- Excellent organizational skills and demonstrated ability to work successfully in multidisciplinary teams.

RESEARCH EXPERIENCE

University of Pennsylvania, Department of Chemical Engineering **Philadelphia, PA**
Postdoctoral Researcher 1/2013 - present

"Supported nanoparticles as heterogeneous catalysts for energy applications"

- Performed the synthesis and characterization of the supported metal@oxide core-shell (metal = Pt, Pd; and oxide = TiO_2, CeO_2, ZrO_2, ZnO) catalytic nanoparticles.
- Determined the catalytic activity and thermodynamic properties of the catalysts in a flow reactor toward methane oxidation, water gas shift reaction, carbon monoxide oxidation and methanol steam reforming.
- Performed the synthesis of catalysts supported on carbon for biomass conversion.
- Assembled and repaired instruments and flow apparatus for catalyst characterization and evaluation.
- Supervised graduate students and provided training on research concepts and techniques.
- Influenced peers to wear appropriate PPE in the laboratory and follow hazardous substance handling and disposal, coordinated the chemical inventory and provide training on the Accelrys CISPro Live system

University of Puerto Rico, Río Piedras Campus, Department of Chemistry **San Juan, PR**
Graduate Research Assistant 9/2005 - 4/2012

"***Development of palladium-based nanocatalysts on carbon support for oxygen reduction reaction***"

- Created an experimental setup for the self-assembly of an organometallic precursor over highly ordered pyrolytic graphite (HOPG) surface leading the formation of well-defined rings at micro- to nanoscale
- Developed the methods for the synthesis of palladium and palladium-cobalt nanoparticles using molecular precursors on carbon black (Vulcan XC-72R) as catalyst for the direct methanol fuel cell (DMFC).
- Prepared samples and characterized their structural properties such as morphology, composition, particle size, surface analysis, metals identification and quantification.
- Determined the electrocatalytic activity toward oxygen reduction reaction, methanol tolerance, and kinetic and mechanism of the reaction, key for the fuel cell commercialization.
- Synthetized and characterized unsupported palladium nanoparticles for ethanol sensors and fuel cells.
- Interpreted data and summarized the findings, prepared annual progress reports, presentations and manuscripts for scientific journals.
- Supervise and train undergraduate and graduate students on instrumentation and techniques.
- Coordinated safety activities in the laboratory: created a chemical inventory, carried out labeling and storage of chemicals in designated areas and promoted the appropriated use and handling of hazardous materials and waste.

NASA-URC Center for Advanced Nanoscale Materials **San Juan, PR**
Microgravity University/Minority Institution Flight Week Program at Johnson Space Center **Houston, TX**
Graduate Research Assistant 3/2011 - 6/2011

"***Microgravity effect on molecular diffusion in nanoporous materials***"

- Designed, built and tested the experimental hardware used in the microgravity experiments.
- Prepared the experimental protocol to understand the effect of microgravity in the diffusion of electroactive species during electrochemical processes.
- Synthesized of the platinum nanoparticles on glassy carbon electrode by electrodeposition technique.
- Studied the ammonia electrooxidation at Pt nanoparticles/nano-supporting electrode systems.

University of Puerto Rico at Cayey, Department of Physics **Cayey, PR**
Graduate Research Assistant 9/2008 - 10/2011

"***Palladium nanostructures synthesis by sputtering deposition for the cathode of direct methanol fuel cells***"

- Synthesized catalytic nanostructures HOPG surfaces as model to be used for fuel cell applications.
- Synthesized the palladium thin film and nanoshell structures by dc-magnetron sputtering and electrospinning techniques on HOPG surfaces.
- Synthesized and characterized the Pd nanostructures on carbon cloth surfaces.
- Studied the nanostructures properties by atomic force microscopy, field emission scanning electron microscopy, X-ray fluorescence, X-ray photoelectron spectroscopy and cyclic voltammetry.
- Evaluated the electrocatalytic activity toward oxygen reduction reaction and methanol tolerance by linear sweep voltammetry.
- Achieved Pd nanostructure formation with higher surface areas and catalytic activity compared to Pd thin films

Cornell Center for Materials Research **Ithaca, NY**
Visitor Research User 09/2009

"***Characterization of palladium-based nanoparticles on carbon black***"

- Characterized palladium and palladium-cobalt nanoparticles on Vulcan XC-72R by X-ray diffraction, scanning transmission electron microscopy with energy dispersive spectrometer, high resolution transmission electron microscopy, and field emission scanning electron microscopy.

NASA-URC Center for Advanced Nanoscale Materials **San Juan, PR**
Graduate Research Assistant Summer 2009

"***Determination of the electrochemical properties of tetraphenylbenzodifurans***"

- Electrochemical characterization of tetraphenylbenzodifurans by cyclic voltammetry in non-aqueous and water/light sensitive system.
- Planned and design experimental protocol for the electrochemical characterization.
- Design the electrochemical cell for the experiment.

University of Puerto Rico, Rio Piedras Campus, Department of Chemistry **San Juan, PR**
Undergraduate Research Assistant 1/2003 - 12/2003

"***Thermal reduction of various molecular cluster precursors to form palladium nanoparticles and nanowires on HOPG surfaces***"

- Prepared the precursor solutions, deposition onto highly ordered pyrolytic graphite surfaces and metallic nanostructures synthesis by thermal reduction.
- Characterized the nanostructures by atomic force microscopy, scanning tunneling microscopy, scanning electron microscopy, transmission electron microscopy, X-ray photoelectron spectroscopy and cyclic voltammetry.
- Created the chemical inventory of 600+ chemicals, storage reagent/solvents in proper place and updated MSDS files.

TEACHING EXPERIENCE

University of Puerto Rico at Cayey **Cayey, PR**
Adjunct Professor 8/2012 - 12/2012

"*General Chemistry I & II and General Chemistry Laboratory I*"

- Teach general chemistry courses for majors and non-majors
- Teach basic laboratory techniques and to follow safety rules
- Preparation of quizzes and tests for the course and the laboratory
- Graded quizzes, tests, reports and laboratory notebooks
- Mentoring and tutoring the students with the courses and research

University of Puerto Rico, Rio Piedras Campus **San Juan, PR**
Teaching Assistant 8/2004 - 6/2005

"*General Chemistry Laboratory I & II*"

- Conduced two laboratory sections per semester for groups of 24+ undergraduate students
- Preparation and grading of quizzes, exams, and lab reports and notebooks
- Mentoring and tutoring the students with the laboratory and general course.

EDUCATION

2012 **Ph.D. in Chemistry** University of Puerto Rico, Río Piedras Campus Advisor: Carlos R. Cabrera

- GPA: 3.60/4.00
- **Dissertation**: *Development of Pd-based nanocatalysts on Carbon Supports for Oxygen Reduction Reaction*
- *Relevant courses*: electrochemistry, advanced instrumental analysis, advanced analytical chemistry, advanced inorganic chemistry, nanotechnology, surface analysis, biochemistry, *ab initio* calculations

2004 **B.S. in Chemistry** University of Puerto Rico, Río Piedras Campus

- GPA: 3.16/4.00
- *Relevant courses*: general chemistry, analytical chemistry, instrumental analysis, inorganic chemistry, physical chemistry, organic chemistry, environmental chemistry, physics, biology, calculus, statistics, human growth and development, evaluation of learning, nature and needs of the exceptional children

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RECENT WORKSHOPS AND TRAININGS

- ACS Summer School on Green Chemistry and Sustainable Energy at Colorado School of Mines (2014)
- Tutorial: Li-ion Batteries to Supercapacitors to Metal-Air Batteries—Energy Storage System to Satisfy High-energy and High-power Applications at Materials Research Society conference (2012)
- Workshop: Science: Becoming the Messenger by National Science Foundation (NSF) at San Juan, PR (2011)
- Workshop: Sensors for aerospace applications by Center for Advanced Nanoscale Materials (2011)
- Workshop: Nano Safety–Introduction to Nanomaterials and Occupational Health at UPR-RP (2011)
- Workshop: Emerging Materials for Thin Film Solar Cells by ICMR at UCSB (2011)
- Workshop: INCREASE 5th Synchrotron Science Workshop at SLAC National Laboratory (2011)
- Training: Field Emission Scanning Electron Microscopy (FE-SEM) at IFN Nanoscopy Facility (2011)
- Summer School: Emerging Perspectives in Catalysis by Center for Enabling New Technologies Through Catalysis at Seattle, Washington (2010)

PUBLICATIONS

1. Ming Onn, T.M.; Arroyo-Ramirez, L.; Monai, M.; Oh, T.-S.; Talati, M.; Fornasiero, P.; Gorte, R.J.; Khader, M.M. "*Modification of a Pd/CeO_2 catalyst by ALD of ZrO_2*", **Applied Catalysis B: Environmental**, in press.
2. Luo, J.; Monai, M.; Yun, H.; Arroyo-Ramírez, L.; Wang, C.; Murray, C.B.; Fornasiero, P.; Gorte, R.J. "*The H_2 Pressure Dependence of Hydrodeoxygenation Selectivities for Furfural Over Pt/C Catalysts*", **Catalysis Letters** 2016, 1-7.
3. Luo, J.; Arroyo-Ramírez, L.; Wei, J.; Yun, H.; Murray, C.B.; Gorte, R.J. "*Comparison of HMF Hydrodeoxygenation over Different Metal Catalysts in a Continuous Flow Reactor*", **Applied Catalysis A: General** 2015, 508, 86-93.
4. Onn, T.M.; Zhang,S.; Arroyo-Ramírez, L.; Chung, Y.-C.; Graham, G.: Pan, X.; Gorte, R.J. "*Improved Thermal Stability and Methane-Oxidation Activity of Pd/Al_2O_3 Catalysts by Atomic Layer Deposition of ZrO2*", **ACS Catalysis** 2015, 5, 5696-5701.
5. Arroyo-Ramírez, L.; Chen, C.; Cargnello, M.; Murray, C.B.; Gorte, R.J. "*A comparison of hierarchical Pt@CeO_2/Si–Al_2O_3 and Pd@CeO_2/Si–Al_2O_3*", **Catalysis Today** 2015, 253 137-141
6. Luo, J.; Arroyo-Ramírez, L.; Tzoulaki, D.; Vlachos, D.G.; Gorte, R.J. "*Hydrodeoxygenation of HMF over Pt/C in a Continuous Flow Reactor*", **AIChE Journal** 2014, 61 (2), 590-597.
7. Arroyo-Ramírez, L.; Chen, C.; Cargnello, M.; Murray, C.B.; Fornasiero, P.; Gorte, R.J. "*Supported Platinum–Zinc Oxide Core–Shell Nanoparticle Catalysts for Methanol Steam Reforming*", **Journal of Materials Chemistry A** 2014, 2 (45), 19509-19514.
8. Díaz-Ayala, R; Arroyo-Ramírez, L.; Raptis, R.G.; Cabrera, C.R. "*Thermal and Surface Analysis of Palladium Pyrazolates Molecular Precursor*", **Journal of Thermal Analysis and Calorimetry** 2014, 115, 479-488.
9. Arroyo-Ramírez, L.; Montano-Serrano, R; Luna-Pineda, T.; Román, F.R.; Raptis, R.G.; Cabrera, C.R. "*Synthesis and Characterization of Palladium and Palladium-Cobalt Nanoparticles on Vulcan XC-72R for Oxygen Reduction Reaction*", ***ACS Applied Materials & Interfaces*** 2013, 5 (22), 11603-11612.
10. Arroyo-Ramírez, L.; Raptis, R.G.; Cabrera, C.R. "*Surface Analysis and Electrochemical Characterization of Palladium-Cobalt Nanoring Formation from Molecular Precursor, $[Et_3NH]_2[CoPd_2(\mu\text{-}4\text{-}I\text{-}3,5\text{-}Me_2pz)_4Cl_4]$, on Highly Ordered Pyrolytic Graphite*", **Surface and Interface Analysis** 2013, 45, 1760-1768.
11. Nicolau, E.; Poventud, C.; Arroyo, L.; Fonseca, J.; Flynn, M.; Cabrera, C.R. "*Microgravity effects on the electrochemical oxidation of ammonia: A parabolic flight experiment*", **Electrochimica Acta** 2012, 75, 88-93.
12. Arroyo-Ramírez, L.; "*Development of Palladium-based Nanocatalysts on Carbon Support for Oxygen Reduction Reaction*", **Dissertation**, University of Puerto Rico, 2012.
13. Arroyo-Ramírez, L.; Rodríguez, D.; Otaño, W.; Cabrera, C.R. "*Palladium Nanoshell Catalysts Synthesis on Highly Ordered Pyrolytic Graphite for Oxygen Reduction Reaction*", **ACS Applied Materials & Interfaces** 2012, 4 (4) 2018-2024.
14. Santos-Pérez, J.; Crespo-Hernández, C.E.; Reichardt, C.; Cabrera, C.R.; Feliciano-Ramos, I.; Arroyo-Ramírez, L.; Meador, M.A. "*Synthesis, Optical Characterization, and Electrochemical Properties of Isomeric Tetraphenylbenzodifurans Containing Electron Acceptor Groups*", **Journal of Physical Chemistry A** 2011, 115 (17) 4157-4168.
15. Arroyo-Ramírez, L.; Figueroa, Y.; Rodríguez, D.; Otaño, W.; Cabrera, C.R. "*Palladium Nanostructures Synthesis by Sputtering Deposition on HOPG Surfaces*", **ECS Transactions** 2010, 28 (7) 1-7.
16. Arroyo-Ramírez, L.; Raptis, R.G.; Cabrera, C.R. "*PdCo Nanoparticles Formation at HOPG and High Surface Area Carbon Support Vulcan XC-72R*", **Materials Research Society Symposium Proceedings** 2010, 1213E, 1213-T10-01.
17. Arroyo-Ramírez, L.; Montano-Serrano, R.; Raptis, R.G.; Cabrera, C.R. "*Nanostructural Formation of Pd-Co Bimetallic Complex on HOPG Surfaces: XPS and AFM Studies*", **Research Letters in Nanotechnology** 2009, 971423.
18. Díaz-Ayala R.; Arroyo, L.; Raptis, R.; Cabrera, C.R. "*Thermal Reduction of Various Molecular Cluster Precursors to Form Pd Nanoparticles and Nanowires on HOPG Surfaces*", **Langmuir** 2004, 20 (19) 8329-8335.

AWARDS, FELLOWSHIPS, GRANTS

- Postdoctoral Fellowship for Academic Diversity (2013-2016)
- Carl Storm Underrepresented Minority (CSURM) Fellowship (2014)
- Focusing on Industrial Recruitment of Scientific Talent (FIRST conference) (2012)
- Puerto Rico NASA Space Grant Consortium Fellowship (2007-2009, 2010-2012)
- International Center for Materials Research (ICMR) Travel Award (2011)
- Toastmasters Competent Leader Award (2011)
- Center for Enabling New Technologies Through Catalysis Travel Award (2010)
- NSF-EPSCoR Institute for Functional Nanomaterials Fellowship (2009-2010)
- The Electrochemical Society Travel Grant (2006, 2008)
- PIRE-ECCI and ICMR Travel Award (2006, 2008)
- PHANTOMS Foundation Travel Bursary (2007)
- MSE@WSA Travel Award (2007)
- Alliance for Graduate Education and the Professoriate Fellowship (2006-2007)
- Society for the Advancement of Chicanos and Native Americans in Science Travel Award (2006)
- Formative Academic Experiences Program: Research Assistantship (2005-2006)
- Formative Academic Experiences Program: Teaching Assistantship (2004-2005)
- Puerto Rico Louis Stokes Alliance for Minority Participation Undergraduate Research Scholarship (2003)
- NSF Alliance for Minority Participation Scholarship (2000-2004)
- Dean's Honor List (2000-2001)
- Natural Science One Hundred Group (2000)

PROFESSIONAL MEMBERSHIPS

- American Chemistry Society (ACS)
- Materials Research Society (MRS)
- Electrochemical Society (ECS)
- Puerto Rico Toastmasters Club (2009-2012)
- Golden Key International Honour Society (2010)
- Sociedad de Estudiantes Graduados de Química (2009-2011)

RECENT PRESENTATIONS

A total of 13 *oral* and 55 poster presentations

- "Supported PdFe Nanoparticles for the Water Gas Shift Reaction", Catalysis Club of Philadelphia (CCP) Meeting; Wilmington, DE (November 2015)
- "Effect of the PdFe alloy in the Catalysis of Water Gas Shift Reaction", XII European Congress on Catalysis (EuropaCat XII); Kazan, Russia (September 2015)
- "*Supported PdFe Nanoparticles for the Water Gas Shift Reaction*", 250th American Chemical Society (ACS) National Meeting; Boston, MA (August 2015)
- "Effect of the PdFe alloy in the Catalysis of Water Gas Shift Reaction", 24th North American Catalysis Society Meeting, Pittsburg, PA (June 2015)
- "Supported Platinum@Oxide Core-Shell Nanocatalysts for Energy Applications", ACS Summer School on Green Chemistry & Sustainable Energy; Golden, CO (July 2014)
- "Synthesis of Supported Metal@Oxide Core-Shell Catalysts by Self-Assembly Method", Gordon Research Conference on Catalysis; New London, NH (June 2014)
- "Platinum@Oxide Core-Shell Nanocatalysts Supported onto Hydrophobic Alumina", NYCS 2014 Spring Symposium; Bethlehem, PA (March 2014)
- "Synthesis of Pt@Oxide Core-Shell Nanoparticles onto Hydrophobic Alumina Support", Catalysis Club of Philadelphia (CCP) Meeting; Wilmington, DE (October 2013)

EXTRACURRICULAR ACTIVITIES

2013-present; Reviewer of manuscripts for scientific journals

2009-2012; NanoDays at Plaza Las Américas, San Juan, PR

Perform interactive demonstrations for K-12 students and general public about nanoscale science and their applications in our life.

2009-2012; Puerto Rico Toastmasters Club

Club Officer: Sergeant at arms (2010-2011)

2011-2012; Outreach at Schools and Universities in Puerto Rico

Perform interactive demonstrations for middle and high school, and undergraduate students about science, nanotechnology and microgravity. Provide information about NASA opportunities for students and teachers in Science, Technology, Engineering, and Mathematics (STEM) fields.

2011; Speech Contest at Area 8 Toastmasters (Puerto Rico Toastmasters Club and Executive Leaders Club)

Jury for humorous speech and evaluation contest, and sergeant at arms of the speech contest, respectively.

2011; 'Planeta Digital' at Plaza Las Américas, San Juan, PR

Usher for tour through interactive demonstrations for K-12 and general public about Universe and Earth. The activity focuses on providing information about natural disasters and how we are affected, how our daily activities affect our planet and what we can do to reduce our impact in the nature.

2010, 2011; Science Fair of Caguas District II at Caguas, PR

Jury for the projects of middle and high school students.

2009–2010; Institute for Functional Nanomaterials Outreach at University of Puerto Rico, Río Piedras Campus

Preparation of the Nanocrystalline Solar Cells module (in Spanish)

2005-2008; AGEP Mentorship Program at University of Puerto Rico, Río Piedras Campus, PR

Mentor for freshman graduate students, help in the coordination of activities in the program and participation in graduate school recruitment activities.

2000-2004; Puerto Rico Louis Stokes Alliance for Minority Participation (PR-LSAMP)

Undergraduate to Graduate Program and Preparation to be Teacher of Mathematics and Science Program

Attended seminars and workshops of different science topics and other that relating to how to teach students, and required to take education courses.

TECHNIQUES

- ***Microscopy***:

  Atomic force microscope (AFM), scanning tunneling microscope (STM), field emission scanning electron microscope (FE-SEM), transmission electron microscope (TEM), high resolution transmission electron microscope (HR-TEM), scanning transmission electron microscope (STEM)

- ***Spectroscopy***:

  Energy dispersive X-ray fluorescence spectrometry (EDS), X-ray photoelectron spectroscopy (XPS), UV-Vis spectroscopy, fourier transform infrared spectroscopy (FTIR), mass spectroscopy (MS), EIS

- ***Electrochemistry***:

  Cyclic voltammetry (CV), linear sweep voltammetry (LSV), rotating disk electrode (RDE), rotating ring-disk electrode (RRDE), electrodeposition

- ***Additional techniques***:

  X-ray diffractometer (XRD), dc-magnetron sputtering, electrospinning, thermogravimetric analysis (TGA), flow reactor, gas chromatography (GC), pulse reactor, inductively coupled plasma, atomic layer deposition (ALD), profilometer, CO chemisorption, BET surface area, furnace, glove-box, standard Schlenk-line, filtration, centrifugation, titrations, pH meter, basic laboratory techniques

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SKILLS

Technical skills

- Expertise in develop and perform experiments for the synthesis and characterization of nanomaterials
- Experienced with sample preparation for morphological and compositional characterization, metals identification and quantification, particle size analysis, and collect, analyze and interpret experimental data
- Ordering reagents and maintain inventory; proper storage of chemicals, use and handling of hazardous materials and waste
- Assembled, repair and maintained laboratory instruments/equipment
- Experienced with design and modification of electrochemical cell for specific experiments
- Knowledge of the concepts, materials and the challenges in heterogeneous catalysis and energy systems

General skills

- Essential knowledge of computer software and programs for acquire and analyze data
- Ability to direct and manage projects and work effectively as a member of an interdisciplinary and multicultural group
- Excellent analytical skills to analyze and interpret data, strong troubleshooting skills
- Excellent problem solving, organizational and prioritization skills
- Strong leadership, teamwork, written and oral communication, and interpersonal skills
- Ability to make effective presentations to diverse groups in English and Spanish