

## CURRICULUM VITAE

### **Rafael Masitas**

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#### **Education:**

University of Louisville, Louisville, KY, USA 2009-2015

Doctor of Philosophy in Chemistry December, 2015

Mentor: Professor Francis P. Zamborini

Dissertation Title: "THE UNIQUE ELECTROCHEMICAL REACTIVITY OF  
SMALL METAL NANOPARTICLES"

GPA = 3.62

Universidad Peruana Cayetano Heredia, LIMA, PERU 2001

Bachelor of Science, Chemistry

## Publications:

1. "Oxidation of Highly Unstable <4 nm Diameter Gold Nanoparticles 800 mV Negative of the Bulk Oxidation Potential". Masitas, R. A.; Zamborini, F. P. *J. Am. Chem. Soc.* **2012**, *134*, 5014-5017
2. "Effect of Surface Charge and Electrode Material on the Size-Dependent Oxidation of Surface-Attached Metal Nanoparticles" Masitas, R. A.; Khachian, I.V.; Bill, B. L.; Zamborini, F. P. *Langmuir* **2014**, *30*, 13075-13084
3. "One-to-One Correlation between Structure and Optical Response in a Heterogeneous Distribution of Plasmonic Constructs" Fang, A.; White, S. L.; Masitas, R. A.; Zamborini, F. P.; Jain P. K. *J. Phys. Chem. C.* **2015**, *119*, 24086-24094
4. "Size-Dependent Electrophoretic Deposition of Catalytic Gold Nanoparticles" Masitas, R. A.; Allen, S. L.; Zamborini, F. P. *J. Am. Chem. Soc.* **2016**, *138*, 15295-15298
5. "Size-Dependent Galvanic Replacement" (In preparation for *ACS Nano*)
6. "Ultrasmall Bare Au Nanoparticles Exhibit Unique Stripping Voltammetry and Low Overpotential for CO<sub>2</sub>" (In preparation for *Langmuir*)
7. "Electrochemical Synthesis of Surface Enhanced Raman Scattering Spectroscopy Paper" (In preparation)
8. "SERS-Paper based analytical devices ( $\mu$ PADs) as a point of care testing" (In preparation)

9. "Plasmonic Photocatalytic CO<sub>2</sub> reduction using Cu(I) and Ag dendrites"

(In preparation)

## **Presentations:**

1. "SERS-Paper Based Analytical Devices ( $\mu$ PADs) as A Point of Care Testing" The Pittsburgh Conference, (Pittcon), Orlando, Florida, March 1, 2018 - TALK by Rafael Masitas
2. "Plasmonic Photocatalytic CO<sub>2</sub> Reduction Using Cu(I) and Ag Dendrites" The Pittsburgh Conference, (Pittcon), Orlando, Florida, February 27, 2018 - POSTER by Rafael Masitas
3. "Plasmonic Photocatalytic CO<sub>2</sub> Reduction Using Cu(I) and Ag Dendrites" Electrochemistry Gordon Research Seminar, Ventura, California, January 6 – 7, 2018 –TALK by Rafael Masitas
4. "Electrochemical Synthesis of Surface Enhanced Raman Scattering Spectroscopy Microfluidic Paper-based device (SERS- $\mu$ PADs)" The Pittsburgh Conference, (Pittcon), Chicago, Illinois, March 8, 2017 - POSTER by Rafael Masitas
5. "Electrochemical Synthesis of Surface Enhanced Raman Scattering Spectroscopy Microfluidic Paper-based device (SERS- $\mu$ PADs)" The 2017 CEC Annual Workshop on Electrochemistry, University of Texas at Austin, Texas, February 11, 2017- POSTER by Rafael Masitas
6. "The Unique Electrochemical Reactivity of Small Metal Nanoparticles" The Pittsburgh Conference, (Pittcon), Atlanta, Georgia, March 8, 2016 - TALK by Rafael Masitas

7. "Electrochemical Deposition of Intact Gold Nanoparticles Onto Electrode Surfaces"  
The 2016 CEC Annual Workshop on Electrochemistry, University of Texas at Austin, Texas, February 13, 2016- POSTER by Rafael Masitas
8. "Selective Deposition of 1-2 nm Diameter Au Nanoparticle onto Electrode Surfaces by Migration" The Pittsburgh Conference, (Pittcon), New Orleans, Louisiana, March 9, 2015 - TALK by Rafael Masitas
9. "Electrophoretic Deposition of Citrate Coated Au Nanoparticles on ITO Substrate and Enhancement of Voltammetric Size Analysis" Southeastern Regional Meeting American Chemical Society, (SERMACS), Nashville, Tennessee, October 19, 2014 – TALK by Rafael Masitas
10. "Effect of Synthesis Method and Electrode Material on the Oxidation Potential of Metal Nanoparticles" The Pittsburgh Conference, (Pittcon), Chicago, Illinois, March 3, 2014 - TALK by Rafael Masitas
11. "Exploring the Unique Electrochemical Reactivity of Metal Nanoparticles" Electrochemistry Gordon Research Seminar and Gordon Research Conference, Ventura, California, January 4 – 10, 2014 –POSTER by Rafael Masitas
12. "Voltammetric Observation of the Oxidation Potential of Au<sub>25</sub> and Au<sub>144</sub> Clusters" 246th American Chemical Society, (ACS), National Meeting & Exposition, Indianapolis, Indiana, September 9, 2013 – TALK by Rafael Masitas
13. "Oxidation of Highly Unstable < 4 nm Diameter Gold Nanoparticles 850 mV Negative of the Bulk Oxidation Potential". The Pittsburgh Conference, (Pittcon), Orlando, Florida, March 11, 2012 - TALK by Rafael Masitas

14. "Ag Nanoparticles Attached to ITO as an Electrocatalyst for Oxygen Reduction Reaction". 2011 Kentucky Statewide Workshop: Renewable Energy & Energy Efficiency, Louisville, Kentucky, March 14, 2011 – POSTER by Rafael Masitas
15. "Ag Nanoparticles Attached to ITO as an Electrocatalyst for Oxygen Reduction Reaction". American Chemical Society Regional Meeting, 42nd Central Regional Meeting, (CERM), Indianapolis, Indiana, June 8, 2011 – TALK by Rafael Masitas
16. "Altering the Electrocatalytic Activity of Au Nanoparticles by Organomercaptan Self-Assembly and Oxidative Stripping Processes". Southeastern Regional Meeting American Chemical Society, (SERMACS), Richmond, Virginia, November 15, 2011 – TALK by Rafael Masitas

### **Research Experience:**

Post-doctoral scholar Feb 2018- Present

Department of Chemistry and Biochemistry, Florida State University, Tallahassee, FL

(Dr. Michael Roper)

Perform experiments in a microfluidic system for investigating islet of Langerhans physiology.

Post-doctoral Research Fellow Dec 2015- Jan 2018

Department of Chemistry and Biochemistry, University of Notre Dame, Notre Dame, IN

and Department of Chemistry and Biochemistry, The Ohio State University, OH

(Dr. Zachary Schultz)

Perform experiments and data analysis related to analysis identification in flowing solutions using Surface Enhanced Raman Scattering (SERS).

### Graduate Research Assistant

University of Louisville, Department of Chemistry, Louisville, KY 2009-2015

As a graduate research assistant, the main focus of my research was the study of the electrochemical properties of 1-4 nanometers diameter Au nanoparticles (NPs) and be the mentor of graduate and undergraduate students. The result of my research at graduate school is summarized in six papers, four papers already published, the first one in *Journal of the American Chemical Society* the second one in *Langmuir*, the third one in *The Journal of Physical Chemistry C* and the last one in *Journal of the American Chemical Society*. Also I have one papers submitted and one paper in preparation to be submitted. As a mentor my work included the training of students on techniques such as Linear Sweep Voltammetry (LSV), Cyclic Voltammetry, Chronocoulometry (CC), UV-Vis spectroscopy, Scanning Electron Microscopy (SEM), synthesis of metallic NPs by chemical and electrochemical methods and functionalization of electrodes with organic linkers. My students were trained in the preparation of their own posters and in the presentation of their own research. The results of this mentoring activity include one Master student, two graduate students that are following my research, two Bachelors in chemistry accepted to graduate school, and two papers with three of my students. Additional duties and responsibilities to my research include, webmaster and person in charge for the maintenance of two potentiostats, CHI 660E and 620A.

## Technical Skills

Electrochemical methods: Voltametry, Chronoamperometry, Chronocoulometry

Microscopy: Atomic Force Microscopy (AFM), and Scanning Electron Microscopy (SEM).

Optical Methods: Raman, Ultraviolet-visible Spectroscopy (UV-VIS), Fluorescence Spectroscopy, Inductively Coupled Plasma Mass Spectrometry (ICP-MS), Atomic Absorption Spectroscopy (AAS), and Infrared (IR) Spectroscopy.

Others: Nuclear Magnetic Resonance (NMR), Matrix Assisted Laser Desorption Ionization Time of Flight (MALDI-TOF), CE-MS, XPS, XRD and Gas Chromatography.

Analysis of Food Products: Mojonnier (Fat), Gerber, Soxhlet, MilkoScan S50 (TS, FT and NTS), Refractometers RFM 742, Color using Hunter L, A and B, Kjeldahl (Buchi system), Viscometer, Titration by Titrino-Metrohm and others.

## **Teaching Experience:**

My teaching experience is divided mainly in two parts, my experience as an instructor and teaching assistant (T.A.) and my mentor activity with graduate and undergraduate students.

## Instructor

University of Louisville at Panama, Panama Summer 2012

As an instructor at University of Louisville at Panama, my duties and responsibilities involved, preparing classes, exams, homework, labs practices, lecturing, grading of exams, homework and lab reports.



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|--|------|
| CHEM 201: General Chemistry I – Overseas program (Instructor)      | 2012 |
| CHEM 207: Intro to Chem Analysis I – Overseas program (Instructor) | 2012 |

### Teaching Assistant and Guest Lecture

#### University of Louisville, Department of Chemistry, Louisville, KY 2009-2012

As a Teaching Assistant at University of Louisville, my duties and responsibilities involved, teach labs practices, office hours to meet with students, grading of lab report and quizzes. As a Guest Lecture, I did the lecturing of one class for Undergraduate level.

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|---|------|
| CHEM 529: Synthesis and Analysis II (Guest lecture)       | 2012 |
| CHEM 209: Intro to Chem Analysis III (Teaching Assistant) | 2010 |
| CHEM 210: Intro to Chem Analysis IV (Teaching Assistant)  | 2010 |
| CHEM 343: Organic Chemistry Lab I (Teaching Assistant)    | 2009 |

#### Universidad Peruana Cayetano Heredia (UPCH) 1999-2000

As a Teaching Assistant at Universidad Peruana Cayetano Heredia, my duties and responsibilities involved, teach labs practices and grading of lab reports.

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|---|------------|
| Elements of Physical Chemistry (Teaching Assistant) | 1999 -2000 |
| Organic Chemistry I (Teaching Assistant)            | 1999 -2000 |

### Mentoring Undergraduate and Graduate Students

#### University of Louisville, Department of Chemistry, Louisville, KY 2010-present

##### *Undergraduate Students*

David Greene III, Lyndsay Kissell, Phuong Lu, Nathan Hughes, Titay Ayano, Bryan Bill, Kevin Elmer, and Hannah Draver. They were trained in citrate-coated Au NPs synthesis,

UV- Visible Spectroscopy and Linear Sweep Voltammetry. As a result of their research my students presented the next list of posters:

David Greene III - "Electrochemical Oxidation of Gold NPs Synthesized Directly on Indium-Tin-Oxide-Coated Glass Electrodes" – Undergraduate Symposium at University of Kentucky, Lexington, Kentucky, April 15, 2011

Titay Ayano (REU Student) – "Electrochemical and Optical Properties of Chemically-Synthesized Au NPs Ranging from Below 4 nm to 30 nm in Diameter" -Chemistry & Structural Biology Research Experience for Undergraduates University of Louisville, Louisville, Kentucky, July 31, 2012

Bryan Bill (REU Student) – "Effect of Electrode Material on the Oxidation Potential of 9 nm Diameter Ag NPs" – Chemistry & Structural Biology Research Experience for Undergraduates University of Louisville, Louisville, Kentucky, July 31, 2013. Additionally to the poster, He is co-author in the paper- "Effect of Surface Charge and Electrode Material on the Size-Dependent Oxidation of Surface-Attached Metal Nanoparticles" Masitas, R. A.; Khachian, I.V.; Bill, B. L.; Zamborini, F.P. *Langmuir* **2014**, *30*, 13075-13084

Kevin Elmer (REU Student) - "Exploring the Effect of Gold Nanoparticle Concentration on the Electrooxidation Potential of Silver NPs" – Chemistry & Structural Biology Research Experience for Undergraduates University of Louisville, Louisville, Kentucky, July 31, 2014

#### *Graduate Students*

Irina Khachian, Dhruba Pattadar, and Stacy Allen. They were trained in citrate-coated Au NP synthesis, UV-VIS Spectroscopy, Linear Sweep Voltammetry, Cyclic Voltammetry

and Scanning Electron Microscopy. As a result of their research my students are co-authors in the next list of papers.

Irina Khachian – “Effect of Surface Charge and Electrode Material on the Size-Dependent Oxidation of Surface-Attached Metal NPs” Masitas, R. A.; Khachian, I.V.; Bill, B. L.; Zamborini, F.P. *Langmuir* **2014**, *30*, 13075-13084

Dhruba Pattadar – “Size-Dependent Galvanic Replacement” (Submitted)

Stacy Allen – “Size-Dependent Electrophoretic Deposition of Catalytic Gold Nanoparticles” Masitas, R. A.; Allen, S. L.; Zamborini, F. P. *J. Am. Chem. Soc.* **2016**, *138*, 15295-15298, and “Unique stripping voltammetry of < 2.0 nm diameter Au Nanoparticles” (manuscript in preparation)

### **Industrial Experience:**

ALS LABORATORY GROUP

2008-2009

Marketing Executive in Environmental Division

- Responsible to develop new analytical techniques for solid, water and air samples on base to the requirements of the market.
- Responsible for the market grow of Environmental Division.

AJEGROUP

2007–2008

Chief of Quality Assurance

- Supervised the line of production of non alcoholic beverage, such as sodas, juices, isotonic beverage, and products based on soy.

- Audit team leader.

NESTLÉ, PERÚ

2002-2007

Quality Coordinator Analyst - Methods Specialist-Chemistry

- Responsible for the Physical Chemistry laboratory in the factory.
- Responsible for results of the Test Inter-laboratories.
- Responsible for the training of analyst at the production lines
- Technical analytical support in the division of applications and development in ice cream, spices, milk, candies, chocolates and cans.
- Validation of In-house methods. TS in Milk.

CAJAMARQUILLA REFINERY (VOTORANTIM METAIS)

2001

Co-op Main laboratory

- Analysis of metals and water with Inductively Coupled Plasma Mass Spectrometry (ICP), Atomic Absorption Spectroscopy (AAS) and Ultraviolet Visible Spectroscopy (UV / VIS).

**Awards:**

The George R. Pack Award Most Outstanding Chemistry PhD Dissertation– University of Louisville, December 2016

Graduate Student Travel Award – The Society for Electroanalytical Chemistry, March 2015

Research Tuition Award – University of Louisville, August 2014 to May 2015

Research Tuition Award – Conn Center for Renewable Energy Research, August 2011 to August 2013

5 consecutive years with classification “A” Higher performance in Interlaboratories Test, Nestle P-test (522 factories and external laboratories around the world) from 2002 to 2006.

**Reviewer**

Analytica Chimica Acta

**Society member**

The Society for Electroanalytical Chemistry

Golden Key (International Honor Society) member

**Languages:**

English and Spanish