Francis Patrick Zamborini

Department of Chemistry
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Educational Background:

Texas A&M University (College Station, TX) 1993-1998
Doctor of Philosophy, December 1998
Department of Chemistry (Dr. Richard M. Crooks)
Dissertation Title: "Scanning Tunneling Microscopy Studies of Corrosion Passivation and Nanometer-Scale Lithography with Self-Assembled Monolayers"

Carthage College (Kenosha, WI) 1989-1993
Bachelor of Arts, May 1993
Department of Chemistry (Dr. Timothy Eckert)
Minor in Mathematics

Research Experience:

Associate Professor
Department of Chemistry, University of Louisville 2007-present
Assistant Professor 2001-present
Department of Chemistry, University of Louisville
Louisville, KY

- Synthesis and assembly of metal nanoparticles, nanorods, and nanowires and applications in electronic- and electrochemical-based gas, vapor, and biosensors.

Postdoctoral Research Associate. 1998-2001
Department of Chemistry, University of North Carolina,
Chapel Hill, NC (Dr. Royce W. Murray)

- Characterized monolayer-protected metal and alloy nanoparticles, studied electron transfer through metal cluster assemblies, and examined the reactivity of monolayer-protected clusters. Mentored two undergraduate researchers.

Doctoral Research Assistant. 1993-1998
Department of Chemistry, Texas A&M University,
College Station, TX (Dr. Richard M. Crooks)

- Studied the use of self-assembled monolayers (SAMs) as barriers towards corrosion processes on metals at the atomic level with electrochemistry and scanning tunneling microscopy (STM). Used STM to perform nanometer-scale lithography on SAM-modified Au surfaces.

Undergraduate Research Assistant 1992
Department of Chemistry, Bowling Green State University,
Bowling Green, OH (Dr. David S. Newman)

- Measured the solid-state ionic conductivity of complexes formed between benzo-18-crown-6-ether and halide salts. Modified the inner channels of a porous polymer (Flemion) with the crown ether-halide salt complexes for use as a separator in a battery.

Research Journal Publications:

Some recent publications at the University of Louisville (Associate Professor)

1. S.R. Beeram; F.P. Zamborini**.** "Selective Attachment of Antibodies to the Edges of Gold Nanostructures for Enhanced Localized Surface Plasmon Resonance Biosensing" *J. Am. Chem. Soc.* **2009**, ASAP Article.
2. R. Dasari; F.P. Zamborini. "Hydrogen Switches and Sensors Fabricated by Combining Electropolymerization and Pd Electrodeposition at Microgap Electrodes" *J. Am. Chem. Soc.* **2008**, *130*, 16138-16139.
3. F.J. Ibañez; F.P. Zamborini. "Chemiresistive Sensing of Volatile Organic Compounds with Films of Surfactant-Stabilized Gold and Gold-Silver Alloy Nanoparticles" *ACS Nano* **2008**, *2*, 1543-1552**.**
4. F.J. Ibañez; F.P. Zamborini. "The Reactivity of Hydrogen with Solid-State Films of Alkylamine- and Tetraoctylammonium Bromide-Stabilized Pd, PdAg, and PdAu Nanoparticles for Sensing and Catalysis Applications" *J. Am. Chem. Soc.* **2008**, *130*, 622-633.
5. G.W. Slawinski; F.P. Zamborini. "Synthesis and Alignment of Silver Nanorods and Nanowires and the Formation of Pt, Pd, and Core/Shell Structures by Galvanic Exchange Directly on Surfaces" *Langmuir* **2007**, *23*, 10357-10365.
6. A.J. Mieszawski; R. Jalilian; G.U. Sumanasekera; F.P. Zamborini. "The Synthesis and Fabrication of One-Dimensional Nanoscale Heterojunctions" *Small* **2007**, *3*, 722-756.
7. F.J. Ibañez; F.P. Zamborini. "Ozone- and Thermally-Activated Films of Palladium Monolayer-Protected Clusters for Chemiresistive Hydrogen Sensing", *Langmuir* **2006**, *22*, 9789-9796.
8. A.J. Mieszawska; G.W. Slawinski; F.P. Zamborini. "Directing the Growth of Highly-Aligned Gold Nanorods by a Surface Chemical Amidation Reaction" *J. Am. Chem. Soc.* **2006**, *128*, 5622-5623.
9. F.J. Ibañez; U. Gowrishetty; M.M. Crain; K.M. Walsh; F.P. Zamborini. "Chemiresistive Vapor Sensing with Microscale Films of Gold Monolayer Protected Clusters" *Anal. Chem.* **2006**, *78*, 753-761.
10. A.J. Mieszawska; R. Jalilian; G.U. Sumanasekera; F.P. Zamborini. "Synthesis of Gold Nanorod/Single Wall Carbon Nanotube Heterojunctions Directly on Surfaces" *J. Am. Chem. Soc.* **2005**, *127*, 10822-10823.
11. A.J. Mieszawska; F.P. Zamborini. "Gold Nanorods Grown Directly on Surfaces from Microscale Patterns of Gold Seeds" *Chem. Mater.* **2005**, *17*, 3415-3420.
12. Z. Wei; F.P. Zamborini. "Directly Monitoring the Growth of Gold Nanoparticle Seeds into Gold Nanorods" *Langmuir* **2004**, *20*, 11301-11304.
13. Z. Wei; A.J. Mieszawska; F.P. Zamborini. "Synthesis and Manipulation of High Aspect Ratio Gold Nanorods Grown Directly on Surfaces" *Langmuir* **2004**, *20*, 4322-4326.
14. F.P. Zamborini; L.E. Smart; M.C. Leopold; R.W. Murray. "Distance-Dependent Electron Hopping Conductivity and Nanoscale Lithography of Chemically-Linked Gold Monolayer Protected Cluster Films" *Anal. Chim. Acta.* **2003**, *496*, 3-16.

Some Research Presentations:

Invited Talks

1. The Pittsburgh Conference in Chicago, IL (March 2006). "Size-Dependent Electrochemical Oxidation of Silver Nanoparticles and Electrochemically-Fabricated Devices."
2. University of Louisville, Department of Chemistry, Louisville, KY (January 2009). "Electrochemical Stability, Reactivity, and Optical Properties of Metal Nanostructures as a Function of Size and Functionality."
3. Miami University of Ohio, Department of Chemistry, Oxford, OH (November 2008). "Electrochemical and Sensing Properties of Chemically- and Electrochemically-Synthesized Metal Nanoparticles and Nanowires."
4. S*ü*d-Chemie Inc., Louisville, KY (November 2008). "Hydrogen Sensing/Reactivity and Vapor Sensing with Films of Metal and Alloy Nanoparticles."
5. Biophysical and Structural Biology Meeting, Brown Cancer Center, University of Louisville, Louisville, KY (June 2008). "Applications of Atomic Force Microscopy, Electrochemistry, and Metal Nanostructures in the Biosciences."

External Grants

1. **Title:** Reactivity of Organic-Modified and Pure and Alloy Metal Nanoparticles
   Source: Kentucky Science and Engineering Foundation
   Role: PI **Award Amount:** $80,000 **Period:** 07/01/09 to 06/30/11
2. **Title:** Electrochemical Oxidation and Sensing/Molecular Electronics Applications of Chemically- and Electrochemically-Synthesized Metal Nanostructures
   Source: National Science Foundation
   Role: PI **Award Amount:** $330,000 **Period:** 07/01/09 to 06/30/12
3. **Title:** Direct Observation of Gold Nanoparticle "Seeds" Growing into Gold Nanorods and the Formation of Patterned Gold Nanorod Assemblies (Supplement)
   Source: American Chemical Society Petroleum Research Fund
   Role: PI **Award Amount:** $5,000 **Period:** 09/01/05 to 08/31/07
4. **Title:** Nanoscale Electronic-Based Vapor, Gas, and Biochemical Sensors
   Source: Kentucky Science and Engineering Foundation
   Role: PI **Award Amount:** $99,998 **Period:** 11/01/05 to 10/31/08
5. **Title:** Seed-Mediated Growth of Gold Nanorods Directly on Surfaces: Growth Mechanism, Functionalization, and Electronic Properties
   Source: National Science Foundation
   Role: PI **Award Amount:** $310,000 **Period:** 8/01/05 to 7/31/08
6. **Title:** Kentucky Partnership for Nanoscale Electronics and Biotechnology
   Source: Kentucky National Science Foundation EPSCoR through UK
   Role: Co-PI (PI-Alphenaar) **Award Amount:** $2,773,758 **Period:** 6/01/05 to 5/31/08
7. **Title:** Direct Observation of Gold Nanoparticle "Seeds" Growing into Gold Nanorods and the Formation of Patterned Gold Nanorod Assemblies
   Source: American Chemical Society Petroleum Research Fund
   Role: PI **Award Amount:** $35,000 **Period:** 09/01/05 to 08/31/07

8. **Title:** Major Research Instrumentation (MRI) Grant: Acquisition of a Virtual Presence Surface Profiling Microscope for Nanomanipulation and Nanoassembly
   Source: National Science Foundation
   Role: Co-PI (PI-Cohn) **Award Amount:** $153,553 **Period:** 08/15/02 to 08/14/05

Internal Grants

1. **Title:** Metal Nanostructures of Varied Size and Shape: Electrochemical Reactivity, Sensing, and Molecular Electronics Applications
   Source: Competitive Enhancement Grant
   Role: PI **Award Amount:** $14,000 **Period:** 10/01/08 to 9/30/09
2. **Title:** Chemical Sensing of Hazardous Materials
   Source: Research Initiation Grant
   Role: PI **Award Amount:** $5,000 **Period:** 1/01/05 to 12/31/05
3. **Title:** Assembly and Electronic Properties of One-Dimensional Gold Nanoparticle Arrays
   Source: Competitive Enhancement Grant
   Role: PI **Award Amount:** $15,000 **Period:** 10/01/03 to 9/31/04
4. **Title:** Fabrication of One-Dimensional Gold Nanoparticle Assemblies for Chemical Sensing on the Nanoscale
   Source: Victor Olorunsola Endowed Research Award for Young Scholars
   Role: PI **Award Amount:** $1200 **Period:** 4/24/03 to 6/30/04
5. **Title:** Analytical Nanochemistry: Surface Forces, Lithography, and Electronic Properties of Nanometer-Sized Materials.
   Source: University of Louisville Start-Up Funds
   Role: PI **Award Amount:** $303,000 **Period:** 7/01/01 to 6/30/03

Teaching Experience:

Assistant Professor 2001-2007
Associate Professor 2007-present
University of Louisville, Louisville, KY

Graduate Ph. D. Research Mentor

1. Francisco J. Ibañez – January 2002 to August 2007 (graduated August 2007)
2. Aneta J. Mieszawska – January 2003 to July 2007 (graduated May 2007)
3. Srinivas Reddy – June 2005 to present
4. Olga S. Ivanova – June 2005 to present
5. Radhika Dasari – August 2005 to present
6. Grzegorz W. Slawinski – August 2007 to present
7. Monica A. Moreno Ruano – January 2008 to present