

Enrique A. López-Guerra

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EDUCATION

The George Washington University

PhD, Mechanical Engineering

Dissertation: Analytical developments for the measurement of viscoelastic properties with the atomic force microscope

Washington D.C.

PhD defense date: March 12, 2018

Submission date: March 20, 2018

University of Maryland-College Park

1st year PhD program, transferred with research advisor

College Park, MD

Kyung Hee University

MSc, Chemical Engineering

Thesis: Preparation and characterization of metal-carbon nanoparticle hybrids and their applications

Suwon, South Korea

February 2012

Universidad del Valle de Guatemala

BSc, Chemical Engineering. Cum Laude

Guatemala City

March 2009

RESEARCH EXPERIENCE

Scanning Probe Microscopy Lab, The George Washington University and University of Maryland-College Park

Graduate Research Assistant, Advisor: Prof. Santiago D. Solares

Development of quantitative techniques to extract mechanical properties of history-dependent materials with the atomic force microscope (AFM).

- Performed nanomechanical characterization of nanoscale materials using different AFM operational schemes such as static force spectroscopy, tapping mode and bimodal AFM.
- Derived fundamental mathematical framework, computational simulations and data analysis techniques to retrieve viscoelastic material properties through static force spectroscopy and tapping mode AFM.
- Implemented theoretical developments in quantitative rheological measurements of polymeric materials and bacterial biofilms.

Advances Materials Physics Lab, Università Cattolica del Sacro Cuore

Visiting researcher, Advisor: Prof. Gabriele Ferrini

Collaborated in the development of ultra-short impulsive atomic force microscopy technique for discrimination of viscoelastic material properties by means of wavelet transforms.

- Performed computational simulations of an AFM probed subjected to sine function excitations and interacting with rheological models.

Organic Nanocomposites Lab, Kyung Hee University

Graduate Research Assistant, Advisor: Prof. Sung Hun Ryu

Synthesis of organometallic nanocomposites for catalytic applications in steam reforming of propane.

- Synthesized nanocomposites comprised by nickel oxide nanoparticles and carbon nanomaterials (e.g., carbon nanotubes, graphene oxide).
- Chemical characterization of synthesized composites using FT-IR and Raman spectroscopy.

USA

Sept 2013-present

Brescia, Italy

Aug 2015-Nov 2015

Suwon, South Korea

March 2010-Feb 2012

PROFESSIONAL SERVICE

Grupo Genesis S.A.

Quality Engineer

On-line quality assurance of physical and chemical properties of household and industrial chemical products.

Villa Nueva, Guatemala

Aug 2008-Feb 2010

TEACHING EXPERIENCE

Universidad Rafael Landívar

Lecturer, Chemistry III, General Chemistry laboratory

Lecturer, Thermodynamics, Fluid Dynamics

Guatemala city

Spring 2012, Fall 2012

Spring 2012

Universidad del Valle de Guatemala

Lecturer, Bioenergy

Undergraduate teaching assistant, Statistics

Guatemala city

Spring 2013

Spring 2007

Universidad San Carlos de Guatemala, Graduate school of engineering

Lecturer, Introduction to nanoscience and nanotechnology

Guatemala city

Fall 2012

Kyung Hee University

Teaching assistant, Fluid Mechanics

Suwon, South Korea

Fall 2011

JOURNAL PUBLICATIONS

1. **López-Guerra, E.A.**; Eslami, B., Solares, S.D. "Calculation of standard viscoelastic responses with multiple retardation times through analysis of static force spectroscopy AFM data." *Journal of Polymer Science Part B: Polymer Physics* 55, no. 10 (2017): 804-813.
2. **López-Guerra, E.A.**; Solares, S.D. "Material property analytical relations for the case of an AFM probe tapping a viscoelastic surface containing multiple characteristic times." *Beilstein Journal of Nanotechnology* 8, no. 1 (2017): 2230-2244.
3. **López-Guerra, E.A.**; Banfi, F.; Solares, S.D.; Ferrini G. "Theory of single-impact atomic force spectroscopy in liquids with materials contrast". *Sci Rep* (2018), In Press.
4. Eslami, B.; **López-Guerra, E.A.**; Raftari, M.; Solares, S.D. "Evolution of nano-rheological properties of Nafion® thin films during pH modification by strong base treatment: A static and dynamic force spectroscopy study." *Journal of Applied Physics* 119, no. 16 (2016): 165301.
5. **López-Guerra, E.A.**; Solares, S.D. "Modeling viscoelasticity through spring-dashpot models in intermittent-contact atomic force microscopy." *Beilstein Journal of Nanotechnology* 5 (2014): 2149.
6. Eslami, B.; **López-Guerra, E.A.**; Diaz A.J.; Solares, S.D. "Optimization of the excitation frequency for high probe sensitivity in single-eigenmode and bimodal tapping-mode AFM." *Nanotechnology* 26, no. 16 (2015): 165703.
7. Nikfarjam, M.; **López-Guerra, E.A.**; Solares, S.D.; Eslami, B. "Higher mode tricks in multifrequency AFM: optimizing sensitivity and indentation depth." *Imaging and Microscopy* 2017, issue 3, 38-39.
8. Nikfarjam, M.; **López-Guerra, E.A.**; Solares, S.D.; Eslami, B.; "Imaging of viscoelastic soft matter with low indentation using higher eigenmodes in single-eigenmode amplitude-modulation atomic force microscopy," *Beilstein J. Nanotech.* 2018, 9, 1116-1122.
9. Diaz, A.J.; Eslami, B.; **López-Guerra, E.A.**; Solares, S.D. "Selection of higher eigenmode amplitude based on dissipated power and virial contrast in bimodal atomic force microscopy." *Journal of Applied Physics* 116, no. 10 (2014): 104901.
10. **López Guerra, E.**, Shanmugharaj, A.M.; Choi, W.S.; Ryu, S.H. "Thermally reduced graphene oxide-supported nickel catalyst for hydrogen production by propane steam reforming." *Applied Catalysis A: General* 468 (2013): 467-474.

11. **López, E.**; Kim, J.; Shanmugharaj, A.M.; Ryu, S.H. "Multiwalled carbon nanotubes-supported Nickel catalysts for the steam reforming of propane." *Journal of Materials Science* 47, no. 6 (2012): 2985-2994.

CONFERENCE PRESENTATIONS

1. **López-Guerra, E.A.**; Solares S.D. "Analytical Solutions for an AFM tip tapping a viscoelastic surface with multiple relaxation times" oral presentation delivered at the 7th Multifrequency AFM conference, April 2018, Madrid, Spain.
2. **López-Guerra, E.A.**; Solares S.D. "Closed-form solutions for the boundary value problem of a flat punch AFM tip tapping on a viscoelastic surface with multiple characteristic times." Oral presentation delivered at MRS Fall Meeting, November 2017, Boston MA.
3. **López-Guerra, E.A.**; Solares S.D. "Retrieving properties of viscoelastic materials with multiple characteristic times through static and dynamic atomic force microscopy." Oral presentation delivered at ASME 11th International Conference on Micro- and Nano Systems, August 2017, Cleveland OH.
4. Solares S.D.; **López-Guerra, E.A.** "Dynamics of multifrequency atomic force microscopy." Oral presentation delivered at ASME 11th International Conference on Micro- and Nano Systems, August 2017, Cleveland OH.
5. **López, E.**; Ryu, S.H.; Shanmugharaj A.M. Silver nanoparticle grafted carbon nanotube capsules: synthesis and characterization. Oral presentation delivered at the 18th International Conference on Composite Materials (ICCM 18th), South Korea.
6. Shanmugharaj, A.M. **López, E.**; Ryu, S.H. "Synthesis and characterization of metal nanoparticle grafted carbon nanotube capsules." Oral presentation delivered at the International Conference on Nanoscience and Nanotechnology (ICNST 2011), South Korea.

AWARDS AND HONORS

Kyung Hee – SENACYT academic scholarship	2010-2012
Kyung Hee University, Secretaría Nacional de Ciencia y Tecnología	
Dean's Fellowship	2013-2014
University of Maryland-College Park	
Cum Laude	2010
Universidad del Valle de Guatemala	

SKILLS

Experimental:	Measurement of mechanical properties of nanoscale materials using static and dynamic atomic force microscopy techniques (e.g., static force spectroscopy, tapping mode, bimodal AFM). Synthesis and characterization of metal-carbon nanohybrids using carbon supports (graphene oxide and carbon nanotubes). Preparation of polymer thin films using spin coating.
Programming:	Python – Proficient, C – Intermediate level.
Applied Mathematics:	Fourier and complex analysis, Laplace and Fourier transforms for solving analytical problems in rheology
Languages:	Spanish – Native, English – Proficient.