

# Ubaldo M. Córdova-Figueroa

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## Education

Ph.D. Chemical Engineering, California Institute of Technology, 2008.

*Thesis:* Directed Motion of Colloidal Particles Via Chemical Reactions: Osmotic Propulsion

*Advisor:* John F. Brady

M.S. Chemical Engineering, California Institute of Technology, 2006.

B.S. Chemical Engineering, University of Puerto Rico—Mayagüez, 2003.

## Academic Appointments

Associate Professor, Department of Chemical Engineering, University of Puerto Rico—Mayagüez, 07/2013 to present.

Adjunct Professor, Ph.D. Program in Computing and Information Science and Engineering, University of Puerto Rico—Mayagüez, 09/2013 to present.

Honorary Associate, Materials Research Science and Engineering Center, College of Engineering, University of Wisconsin—Madison, 11/2009 to present.

Assistant Professor, Department of Chemical Engineering, University of Puerto Rico—Mayagüez, 07/2008 to 06/2013.

Instructor, Department of Chemical Engineering, University of Puerto Rico—Mayagüez, 07/2003 to 06/2008.

## Honors, Awards, & Fellowships

UPRM College of Engineering Distinguished Researcher, 2013-2014

UPRM Chemical Engineering Outstanding Professor, 2011-2012

NSF CAREER Award, 2011-2016

NSF EPSCoR Faculty Start-Up Award, 2009

Graduate Study Fellowship, Chemical Engineering, California Institute of Technology, 2003

Honorary Citizen of Cataño, PR, 2003

Honor Student, Department of Chemical Engineering, University of Puerto Rico—Mayagüez, 2001–2003

Distinguished Student of the Year, Cataño, PR, 2002.

## Research Interests

Fluid Dynamics, Transport Phenomena, and Colloidal Physics: Brownian and Stokesian Dynamics Simulations, Low Reynolds Number Flow, Microrheology, Complex Fluids, Colloidal Suspensions, Colloidal Devices, and Granular Flows

## Publications Submitted or in Preparation

15. L. Nieves-Rosado, A. Khair & U. M. Córdova-Figueroa, "Self-propulsion of slender colloidal particles powered by enzymatic reactions". (in preparation)

## Publications

14. M. Diaz-Maldonado & U. M. Córdova-Figueroa, "Dynamics and rheology of Janus drops in a linear shear flow". *Int. J. Multiphase Flow.* 2–13 (2016)
13. N. Sharifi-Mood, A. Mozaffari & U. M. Córdova-Figueroa, "Pair interaction of catalytically active colloids: from assembly to escape", *J. Fluid Mech.* (accepted)
12. R. DeLaCruz-Araujo, D. J. Beltrán-Villegas, R. Larson & U. M. Córdova-Figueroa, "Rich Janus colloid phase behavior under steady shear", *Soft Matter.* (2016) DOI: 10.1039/C6SM00183A
11. K. K. Dey, X. Zhao, B. M. Tansi, W. J. Méndez-Ortiz, U. M. Córdova-Figueroa, R. Golestanian, & A. Sen, "Micromotors powered by enzyme catalysis", *Nano Lett.* 15, 8311–8315 (2015).
10. M. Diaz-Maldonado & U. M. Córdova-Figueroa, "On the anisotropic response of a Janus drop in a shearing viscous fluid". *J. Fluid Mech.* 770, R2 (2015).
9. C. Ye, L. Kennedy, K. Shirk, U. M. Córdova-Figueroa, J. Youngblood & C. J. Martinez, "CNC loaded hydrogel particles generated from single and double emulsion drops". *Green Materials.* 3 (1), 25–34 (2014).
8. S. Sengupta, D. Patra, I. Ortiz-Rivera, A. Agrawal, S. Shklyaev, K. K. Dey, U. M. Córdova-Figueroa, T. E. Mallouk & A. Sen, "Self-powered enzyme micropumps". *Nat. Chem.* 6, 415–422 (2014).
7. S. Shklyaev, J. F. Brady & U. M. Córdova-Figueroa, "Nonspherical osmotic motor: Chemical sailing". *J. Fluid Mech.* 748, 488–520 (2014).
6. S. Shklyaev, A. Ivantsov, M. Díaz-Maldonado & U. M. Córdova-Figueroa, "Dynamics of a Janus drop in an external flow". *Phys. Fluids.* 25, 082105 (2013).
5. U. M. Córdova-Figueroa, S. Shklyaev & J. F. Brady, "Osmotic propulsion of colloidal particles via constant surface flux". *Soft Matter.* 9, 6382–6390 (2013).
4. Y. Hong, M. Diaz, U. M. Córdova-Figueroa & A. Sen, "Titanium dioxide-based photo-induced micro fireworks and micro-motor/micro-pump systems ", *Adv. Func. Mater.* 20, 1–9 (2010).
3. U. M. Córdova-Figueroa & J. F. Brady, "Comment on "Osmotic propulsion: the osmotic motor" reply", *Phys. Rev. Lett.* 103, 079802 (2009).
2. U. M. Córdova-Figueroa & J. F. Brady, "Comment on "Osmotic propulsion: the osmotic motor" reply", *Phys. Rev. Lett.*, 102, 159802 (2009).
1. U. M. Córdova-Figueroa & J. F. Brady, "Osmotic propulsion: the osmotic motor", *Phys. Rev. Lett.* 100, 158303 (2008).

## Non-Peer Reviewed Publications

1. U. M. Córdova-Figueroa & C. Martinez, "Effective Research: There's an App for That", *SHPE Magazine*, **16** (1), 26–27 (2014).

## Invited Seminars

"Microstructure and rheology of patchy particle suspensions via Brownian dynamics simulation", Department of Chemical Engineering, Texas Tech University. April 17, 2015.

"Designing self-powered nanorobots", Physics Colloquium, Department of Physics, University of Puerto Rico—Mayagüez, PR. March 5, 2015.

"Productivity Apps: Tools To Make Our Work Easier!", University of Puerto Rico—Mayagüez, PR. January 29, 2015.

"Reconfigurable and multifunctional active soft materials", Universidad de Guanajuato, León, México. November 25, 2014.

"Reconfigurable and multifunctional soft materials: big opportunities for new consumer products", Proctor & Gamble, Cincinnati, OH. July 29, 2014.

"Dynamics of self-propelling magnetic colloids", Department of Chemical Engineering, City College of New York, NY. March 10, 2014.

"Enhanced aggregation of self-propelled magnetic colloidal particles by Brownian dynamics simulation", Department of Mechanical Engineering, University of Puerto Rico—Mayagüez, PR. February 26, 2014.

"Technology and web tools for effective time management and research", SHPE Annual Conference - Graduate Institute, Indianapolis, Indiana. October 31, 2013.

"Aggregation in a suspension of self-propelled magnetic colloidal particles studied via Brownian dynamics simulations", XXII International Materials Research Congress - Nanostructured Materials and Nanotechnology Symposium, Cancun, Mexico. August 11-15, 2013.

"Random walk and catalytic propulsion", SONW WiPREM Workshop for Teachers, Rincón, Puerto Rico. May 25, 2013.

"Modeling of reconfigurable soft materials based on catalytically-driven colloidal particles", UPRM CISE Lecture, Mayagüez, PR. February 28, 2013.

"Modeling of reconfigurable soft materials based on catalytically-driven colloidal particles", UPRRP Chemical Physics Seminar, Rio Piedras, PR. February 5, 2013.

"Technology and web tools for effective research", SHPE Annual Conference - Graduate Institute, Fort Worth, Texas. November 15, 2012.

"Brownian motion", SONW - WiPREM Teacher Workshop, UPRM, PR. November 10, 2012.

"Viscous flows and Brownian motion", Science on Wheels Wisconsin-Puerto Rico NSF PREM Workshop for Teachers, Rincón, PR. May 26, 2012.

"Dynamic simulations of reconfigurable complex fluids based on Janus and catalytically-driven colloidal particles", Math Colloquium, Department of Mathematics, University of Puerto Rico—Mayagüez, PR. February 23, 2012.

"Autonomous motion of colloidal particles induced by chemical reactions," Institute for Functional Nanomaterials IRG1 Research Symposium, Aguadilla, PR. January 27-28, 2012.

"Effects of sub-lethal concentrations of nanoparticles in the metabolism of *Enterococcus faecalis*," Institute for Functional Nanomaterials IRG1 Research Symposium, Aguadilla, PR. January 27-28, 2012.

"CAREER: Dynamic simulations of reconfigurable complex fluids based on Janus and catalytically-driven colloidal particles", poster at 2011 CAREER Award Regional Forum, Louisiana State University, Baton Rouge, LA. November 8-9, 2011.

"Dynamic simulations of reconfigurable and active colloidal suspensions", Department of Mechanical Engineering, University of Puerto Rico—Mayagüez, PR. February 2011.

"Directed motion of catalytically-driven colloidal particles responsive to magnetic fields using Brownian dynamics simulation", UCSB Chemical Engineering Todd Squires Research Group, CA. February 2010.

"Modeling and simulations of anisotropic "Janus" colloidal particles", Math Colloquium, Department of Mathematics, University of Puerto Rico—Mayagüez, PR. September 2009.

"Directed motion of colloidal particles via chemical reactions: osmotic propulsion", Materials Research Science and Engineering Center, Penn State University, PA. June 2009.

"Directed motion of colloidal particles via chemical reactions: osmotic propulsion", School of Materials Engineering, Purdue University, IN, May 2009.

"Propulsion of colloidal particles via chemical reactions", Department of Chemical Engineering, Tennessee Tech University, TN. February 2009.

"Self-propulsion of colloidal particles at low Reynolds number", Department of Mechanical Engineering, University of Puerto Rico—Mayagüez, PR. September 2008.

"Propulsion of a colloidal particle by an osmotic pressure imbalance resulting from surface reaction", Department of Chemical Engineering, University of Puerto Rico—Mayagüez, PR. August 2005.

## Presentations at National/International Meetings

"Pair interaction of catalytically active colloids: from assembly to escape", poster at GRC CMPS, Ventura, CA. February 7-12, 2016.

"Brownian dynamics simulations of spherical colloids in a suspension of ellipsoids interacting via the Gay-Berne potential", AIChE Annual Meeting, Atlanta, GA. November 20, 2014.

"Dynamics of a self-propelled magnetic colloidal particle", ACS Colloid & Surface Science Symposium, Philadelphia, PA. June 24, 2014.

"Aggregation in a suspension of self-propelled magnetic colloidal particles studied via Brownian dynamics simulations", AIChE Annual Meeting, San Francisco, CA. November 6, 2013.

"Rheology of Janus particle suspensions via Brownian dynamics simulation", AIChE Annual Meeting, San Francisco, CA. November 6, 2013.

"Stokes flow past a Janus droplet", ACS Annual Meeting, New Orleans, Louisiana. April 9, 2013.

"Interaction of two particles in a chemically reactive medium", AIChE National Conference, Pittsburgh, Pennsylvania. November 1, 2012.

"Dynamics of a Janus droplet in a external flow", AIChE National Conference, Pittsburgh, Pennsylvania. October 30, 2012.

"Janus droplet subject to an external flow", poster at Gordon Research Conference CMPS, Ventura, CA. February 8-9, 2012.

"Osmotic motor under fixed flux conditions", American Physical Society Division of Fluid Dynamics Annual Meeting, Baltimore, MD. November 21, 2011.

"Osmotic motor: influence of hydrodynamic interaction for a releasing particle", 2011 AIChE National Meeting, Minneapolis, MN. October 17, 2011.

"Magnetically guided propulsion of osmotic motors", American Physical Society Division of Fluid Dynamics Annual Meeting, Long Beach, CA. November 2010.

"Autonomous motion of semipermeable colloidal particles via chemical reactions: self-osmophoresis", American Physical Society Division of Fluid Dynamics Annual Meeting, Long Beach, CA. November 2010.

"Intracellular metabolism of substrates enhances single-cell diffusion in *Enterococcus faecalis* a non-motile bacterium", AIChE Annual Meeting, Salt Lake City, UT. November 2010.

"Guided motion of self-propelled magnetic colloidal particles by Brownian dynamics simulations", AIChE Annual Meeting, Salt Lake City, UT. November 2010.

"Directed motion of catalytically-driven colloidal particles responsive to magnetic fields using Brownian dynamics simulation", poster at GRC CMPS, Ventura, CA. February 2010.

"Brownian dynamics simulations of the short and long time behavior of osmotic motors subject to a magnetic field", 2009 AIChE Annual Meeting, Nashville, TN. November 11, 2009.

"Reaction-driven motion of bacteria", 2009 AIChE Annual Meeting, Nashville, TN. November 10, 2009.

"Osmotic propulsion: the osmotic motor", American Physical Society Division of Fluid Dynamics Annual Meeting, San Diego, FL. August 2005.

"Synthesis and characterization of binary and ternary nanoparticle oxide for the photocatalytic oxidation of toluene using UV and visible light", Puerto Rico Interdisciplinary Scientific Meeting, University of Puerto Rico—Rio Piedras, PR. March 2003.

## Presentations by Students, Postdocs & Collaborators

C. E. Pérez-De Jesús, M. Karim & U. M. Córdova-Figueroa, "Polymer dynamics in active Brownian particle suspensions", poster at APRUM Research Day, University of Puerto Rico—Mayagüez, PR. May 5, 2016.

M. Díaz-Maldonado & U. M. Córdova-Figueroa, "Dynamics and rheology of Janus drops in a shear flow", poster at EPSCoR IFN Annual Meeting, Caguas, PR. April 22-23, 2016.

R. A. DeLaCruz-Araujo, D. J. Beltran-Villegas, R. G. Larson & U. M. Córdova-Figueroa, "Rich Janus colloid phase behavior under steady shear", poster at EPSCoR IFN Annual Meeting, Caguas, PR. April 22-23, 2016.

C. E. Pérez-De Jesús, M. Karim & U. M. Córdova-Figueroa, "Polymer dynamics in active Brownian particle suspensions", poster at Sigma Xi Poster Day, University of Puerto Rico—Mayagüez, PR. April 19, 2016.

- R. A. DeLaCruz-Araujo, D. J. Beltran-Villegas, R. G. Larson & U. M. Córdova-Figueroa, "Rich Janus colloid phase behavior under steady shear", APS March Meeting 2016, Baltimore, MD. March 14-18, 2016.
- C. E. Pérez-De Jesús, M. Karim & U. M. Córdova-Figueroa, "Polymer dynamics in active Brownian particle suspensions", 2016 Junior Technical Meeting (JTM) and the Puerto Rico Interdisciplinary Meeting (PRISM), Pontifical Catholic University of Puerto Rico, Ponce Campus, Ponce, PR. March 5, 2016.
- L. Nieves-Rosado, A. Khair & U.M. Córdova-Figueroa, "Self-propulsion of slender colloidal particles by asymmetric, non-linear surface reactions", poster at GRC CMPS, Ventura, CA. February 7-12, 2016.
- M. Karim & U.M. Córdova-Figueroa, "Anomalous diffusion and microstructure of active patchy particle clusters", poster at GRC CMPS, Ventura, CA. February 7-12, 2016.
- N. Sharifi-Mood, A. Mozaffari & U.M. Córdova-Figueroa, "Pair interaction of catalytically active colloidal particles: From assembly to escape", ACS Colloid & Surface Science Symposium, Pittsburgh, PA. June 15, 2015.
- C. Ye, L. Kennedy, K. Shirk, U.M. Córdova-Figueroa & C. Martinez, "Cellulose nanocrystal hydrogel particles and capsules from single and double emulsion drops", ACS Colloid & Surface Science Symposium, Pittsburgh, PA. June 15, 2015.
- T. Long, L. Rivera-Rivera, J. Koplík, U. M. Córdova-Figueroa & I. Kretzschmar, "Impact of enhanced diffusion on assembly rate of magnetic Janus particles", poster at ACS Colloid & Surface Science Symposium, Pittsburgh, PA. June 15, 2015.
- R. A. De La Cruz-Araujo & U. M. Córdova-Figueroa, "Microstructure and Rheology of Patchy Particle Suspensions via Brownian Dynamics Simulations", Chemical Engineering Graduate Research Spring Symposium, University of Puerto Rico—Mayagüez, Mayagüez, PR. April 17, 2015.
- L. Nieves-Rosado & U. M. Córdova-Figueroa, "Effective reaction rate of an anisotropic catalytic particle subject to uniform flow", 2015 Junior Technical Meeting (JTM) and the Puerto Rico Interdisciplinary Scientific Meeting (PRISM), University of Puerto Rico—Rio Piedras, Rio Piedras, PR. March 14, 2015.
- L. Rivera-Rivera & U. M. Córdova-Figueroa, "Aggregation of self-propelled colloidal magnetic particles via Brownian dynamics simulations", Mechanical Engineering Graduate Seminar, Department of Mechanical Engineering, University of Puerto Rico—Mayagüez, Mayagüez, PR. November 5, 2014.
- L. Rivera-Rivera & U. M. Córdova-Figueroa, "Self-assembly of active magnetic particles via Brownian dynamics simulation", poster at AIChE SRC, San Juan, PR. March 21-23, 2014.
- R. De La Cruz-Araujo & U. M. Córdova-Figueroa, "Microstructure and rheology of patchy particle suspensions", poster at AIChE SRC, San Juan, PR. March 21-23, 2014.
- L. Rivera-Rivera & U. M. Córdova-Figueroa, "Self-assembly of active magnetic particles via Brownian dynamics simulation", poster at GRC CMPS, Ventura, CA. February 15-21, 2014.
- R. De La Cruz-Araujo & U. M. Córdova-Figueroa, "Rheology of a patchy particle suspension via Brownian dynamics simulation", poster at GRC CMPS, Ventura, CA. February 15-21, 2014.
- M. Díaz-Maldonado, A. Ivantsov, S. Shklyaev & U. M. Córdova-Figueroa, "Dynamics of a Janus droplet in a linear shear flow", American Physical Society Division of Fluid Dynamics Annual Meeting, Pittsburgh, PA. November 24, 2013.
- M. Díaz & U. M. Córdova-Figueroa, "Self-motion of soft particles via surface flux", Physics Department Seminar Series, Perm State University, Perm, Russia. November 22, 2013.

- G. C. Vidal-Urquiza & U. M. Córdova-Figueroa, "Guided motion of self-propelled magnetic colloidal particles", SHPE Annual Conference, Indianapolis, Indiana. October 30, 2013.
- C. Santoni & U. M. Córdova-Figueroa, "Self-diffusion and interaction of colloids in liquid crystals via Brownian dynamics simulation", poster at 84th Society of Rheology Annual Meeting, Pasadena, California. February 13, 2013.
- S. Shklyaev & U. M. Córdova-Figueroa, "Interaction of two particles in a chemically reactive medium", Seminar on Self-propulsion, Penn State University, Pennsylvania. November 25, 2012.
- S. Shklyaev, A. O. Ivantsov, M. Díaz & U. M. Córdova-Figueroa, "Janus droplet motion in an external flow", APS DFD Meeting, San Diego, California. November 20, 2012.
- S. Shklyaev, J. F. Brady & U. M. Córdova-Figueroa, "Chemical sailing: nonspherical catalytic motors", Perm Seminar on Fluid Dynamics, Perm State University, Russia. April 6, 2012.
- J. Soto-Rodríguez, M. Díaz-Maldonado, L. Ríos-Hernández, A. Sen & U. M. Córdova-Figueroa, "Bacterial Diffusion: A metabolic-dependent phenomenon?", JTM/PRISM Meeting, Carolina, PR. March 10, 2012.
- M. Diaz & U. M. Córdova-Figueroa, "Catalytically driven motion of semipermeable colloidal particles", poster at JTM/PRISM Meeting, Carolina, PR. March 10, 2012.
- C. Santoni & U. M. Córdova-Figueroa, "Brownian dynamics simulation of colloids suspended in a liquid crystal", poster at JTM/PRISM Meeting, Carolina, PR. March 10, 2012.
- E. Y. Aymat-Liaño, U. M. Córdova-Figueroa & C. Velázquez-Figueroa, "Effect of Lubricant and pore size distribution on the Rheological properties of Granular materials", poster at JTM/PRISM Meeting, Carolina, PR. March 10, 2012.
- G. C. Vidal-Urquiza, C. Rinaldi & U. M. Córdova-Figueroa, "Guided Motion of Catalytically-driven Magnetic Colloidal Particles by Brownian Dynamics Simulation", poster at JTM/PRISM Meeting, Carolina, PR. March 10, 2012.
- M. Diaz & U. M. Córdova-Figueroa, "Catalytically-driven motion of semipermeable colloidal particles: self-osmophoresis", poster at Gordon Research Conference CMPS, Ventura, CA. February 8-9, 2012.
- G. C. Vidal-Urquiza, C. Rinaldi & U. M. Córdova-Figueroa, "Guided motion of catalytically-driven magnetic colloidal particles by Brownian dynamics simulation", poster at Institute for Functional Nanomaterials IRG<sub>1</sub> Research Symposium, Aguadilla, PR. January 27-28, 2012.
- S. Shklyaev, J. F. Brady & U. M. Córdova-Figueroa, "Chemical sailing: nonspherical catalytic motors", Institute for Functional Nanomaterials IRG<sub>1</sub> Research Symposium, Aguadilla, PR. January 27-28, 2012.
- S. Shklyaev, J. F. Brady & U. M. Córdova-Figueroa, "Reaction-enhanced diffusion of colloidal particles", poster at Institute for Functional Nanomaterials IRG<sub>1</sub> Research Symposium, Aguadilla, PR. January 27-28, 2012.
- S. Shklyaev, J. F. Brady & U. M. Córdova-Figueroa, "Chemical sailing: nonspherical catalytic motors", APS DFD Annual Meeting. November 21, 2011.
- J. Soto-Rodríguez, M. Díaz-Maldonado, L. Ríos-Hernández, A. Sen & U.M. Córdova-Figueroa, "Intracellular Metabolism of Substrates Enhances Single-Cell Diffusion in Enterococcus faecalis a Non-Motile Bacterium", poster at PRSM Semi Annual Meeting, Bayamón Puerto Rico. November 5, 2011.

- J. Soto-Rodríguez, M. Díaz-Maldonado, L. Ríos-Hernández, A. Sen & U.M. Córdova-Figueroa, "Intracellular Metabolism of Substrates Enhances Single-Cell Diffusion in *Enterococcus faecalis* a Non-Motile Bacterium", poster at SHPE National Conference, Anaheim California. October 28, 2011.
- S. Shklyayev, J. F. Brady & U. M. Córdova-Figueroa, "Reaction-enhanced diffusivity", AIChE National Conference, Minneapolis Minnesota. October 17, 2011.
- J. Soto-Rodríguez, M. Díaz-Maldonado, L. Ríos-Hernández, A. Sen & U. M. Córdova-Figueroa, "Intracellular Metabolism of Substrates Enhances Single-Cell Diffusion in *Enterococcus faecalis* a Non-Motile Bacterium", poster at AIChE National Conference, Minneapolis Minnesota. October 17, 2011.
- S. Shklyayev, J. F. Brady & U. M. Córdova-Figueroa, "Osmotic motors: concept and several problem", Seminar Series at the Institute of Continuous Media Mechanics, Perm, Russia. August 31, 2011.
- S. Shklyayev, J. F. Brady & U. M. Córdova-Figueroa, "Osmotic motor: concept and new results", Seminar Series at the University of Potsdam, Germany. June 21, 2011.
- Shklyayev, J. F. Brady & U. M. Córdova-Figueroa, "Reaction-enhanced diffusivity", 5th Southern California Symposium on Flow Physics, Los Angeles California. April 2011.
- Glenn C. Vidal-Urquiza, Carlos Rinaldi & Ubaldo M. Córdova-Figueroa, "Magnetically Guided Motion of Osmotic Motors", 5th Southern California Symposium on Flow Physics, Los Angeles California. April 2011.
- J. E. Rosado-Marrero, N. M. Rodríguez-Fuentes, E. Aymat & U. M. Córdova-Figueroa, "Synthesis and Characterization of Au-PS Janus Particles: Self-Propelled Micro-Heaters", AIChE Regional Conference, Atlanta Georgia. April 2011.
- L. Ruiz, E. Acevedo & U. M. Córdova-Figueroa, "Catalytically-driven motion of concentrated Pt-PS Janus particle suspensions", AIChE Southeast Regional Conference 2011, Georgia Institute of Technology. April 2011.
- J. E. Rosado-Marrero, N. M. Rodríguez-Fuentes, E. Aymat & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", PRISM 2011 Interamerican University-Bayamón. March 2011.
- L. Ruiz, E. Acevedo & U. M. Córdova-Figueroa, "Catalytically-driven motion of concentrated Pt-PS Janus particle suspensions", PRISM 2011 Interamerican University-Bayamón. March 2011.
- L. Medina, W. Rivera, M. Díaz, J. Soto, J. López, M. López, R. Cortes, L. Ríos-Hernández & U. M. Córdova-Figueroa, "Intracellular metabolism of substrates enhances single-cell diffusion in *Enterococcus faecalis* a non-motile bacterium", PRISM 2011 Interamerican University-Bayamón. March 2011.
- E. Aymat, C. Martinez & U. M. Córdova-Figueroa, "Self-propulsion of platinum/polyelectrolyte microshells in the presence of different reactant concentrations", PRISM 2011 Interamerican University-Bayamón. March 2011.
- J. E. Rosado-Marrero, N. M. Rodriguez-Fuentes, E. Aymat & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", poster at 3rd Convention of Chemical Engineering Students of Puerto Rico. February 2011.
- L. Ruiz, E. Acevedo & U. M. Córdova-Figueroa, "Catalytically-driven motion of concentrated Pt-PS Janus particle suspensions", poster at 3rd Convention of Chemical Engineering Students of Puerto Rico. February 2011.
- S. Shklyayev, J. F. Brady & U. M. Córdova-Figueroa, "Long-time self-diffusivity of a catalytic particle in a dilute suspension", APS DFD Annual Meeting. November 2010.



- E. Moro, L. D. Ruiz, E. Acevedo & U. M. Córdova-Figueroa, "Catalytically-driven motion of concentrated Pt-PS Janus particle suspensions", poster at 34th Annual ACS Technical Meeting. November 2010.
- M. Diaz & U. M. Córdova-Figueroa, "Catalytically driven motion of semipermeable colloidal particles: self-osmophoresis", AIChE Annual Meeting. November 2010.
- S. ShklyaeV, J. F. Brady & U. M. Córdova-Figueroa, "The long-time self-diffusivity of catalytic colloidal particles", AIChE Annual Meeting. November 2010.
- E. Aymat, C. Martinez & U. M. Córdova-Figueroa, "Self-propulsion of platinum/polyelectrolyte microshells in the presence of different reactant concentrations", poster at AIChE Annual Meeting. November 2010.
- N. M. Rodriguez-Fuentes, J. E. Rosado-Marrero, E. Aymat & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", poster at AIChE Annual Meeting. November 2010.
- G. C. Vidal, C. Rinaldi & U. M. Córdova-Figueroa, "Guided motion of self-propelled magnetic colloidal particles by Brownian dynamics simulations", poster at Society of Rheology 82nd Annual Meeting. October 2010.
- E. Aymat, E. Fernandez, N. Rodriguez, J. Rosado & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", poster at IFN EPSCoR Annual Meeting, PR. May 2010.
- G. C. Vidal, C. Rinaldi & U. M. Córdova-Figueroa, "Guided motion of self-propelled magnetic colloidal particles by Brownian dynamics simulations", poster at IFN EPSCoR Annual Meeting, PR. May 2010.
- M. Higaldo, J. Lopez, J. Soto, M. Diaz, L. Rios-Hernandez & U. M. Córdova-Figueroa, "Intracellular metabolism enhances single-cell diffusion in *Enterococcus faecalis* a non-motile bacterium", poster at PR-LSAMP 5th Transdisciplinary Research Conference, PR. May 2010.
- E. Aymat, E. Fernandez & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", JTM/PRISM 2010, PR. March 2010.
- G. C. Vidal, C. Rinaldi & U. M. Córdova-Figueroa, "Guide motion of osmotic motors by magnetic fields", poster at UPRM 4th NEA Science Day, Mayagüez, PR. February 2010.
- E. Aymat, E. Fernandez & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", poster at UPRM 4th NEA Science Day, Mayagüez, PR. February 2010.
- N. Rodríguez, U. M. Córdova-Figueroa & C. Martinez, "Motion of self-propelled Janus particles inside double emulsion drops", poster at the 2009 AIChE Annual Meeting, Nashville, TN. November 9, 2009.
- R. Suarez & U. M. Córdova-Figueroa, "Synthesis and characterization of Au-PS Janus particles: self-propelled micro-heaters", poster at UPRM REU program in Functional and Nanostructured Materials, Mayagüez, PR. July 2009.

## Professional Service

**Member:** American Physical Society, American Institute of Chemical Engineers, American Chemical Society, Society of Rheology, Society of Hispanic Professional Engineers

**Reviewer:** Journal of Rheology, Soft Matter, Physical Review Letters, Chemical Engineering Communications, Europhysics Letters, Advanced Functional Materials, Langmuir, Nanoscale, Physical Review Fluids

**Conference Organization:**

Organizer: C.2 Colloidal Soft Matter (2016 XXV International Materials Research Congress, Cancun, MX)

Chair: 10D Numerical Methods for Molecular and Mesoscopic Systems (2009 AIChE Annual Meeting), 01J Novel Numerical Methods In Fluids (2011 AIChE Annual Meeting), G25 Suspensions II (2011 APS Division of Fluid Mechanics Annual Meeting), Graduate Institute (2012, 2013, 2014, 2015 SHPE Annual Conference), Poster Session (84th Annual Meeting of The Society of Rheology), 01C Colloidal Dispersions I (2014, 2016 AIChE Annual Meeting), 01C Colloidal Dispersions II (2013, 2014, 2016 AIChE Annual Meeting)

Co-Chair: 10D Mathematical and Computational Biosystems Engineering (2009 AIChE Annual Meeting), 01C Colloidal Dispersions I (2011, 2012, 2013, 2015 AIChE Annual Meeting), 01C Colloidal Dispersions II (2011, 2012, 2015 AIChE Annual Meeting), 01C Colloidal Dispersions III (2012 AIChE Annual Meeting), 10D Dynamics, Reduction and Control of Distributed Parameter Systems (2011 AIChE Annual Meeting), 10D Multiscale Modeling: Methods and Applications (2012 AIChE Annual Meeting)

## Teaching Experience

INQU4008 Mathematical Analysis of Chemical Engineering Problems (Fall 2009)

INQU4010 Momentum Transfer Operations (Fall 2008, Spring 2009, Spring 2010, Fall 2010, Spring 2011, Fall 2012, Fall 2014)

INQU4027 Undergraduate Seminar (Fall 2008)

INQU4105 Entering Research in Chemical Engineering I & II (Fall 2013, Spring 2014, Fall 2014, Spring 2015, Fall 2015, Spring 2016)

INQU5085 Soft Materials (Fall 2015)

INQU6001 Mathematical Methods in Chemical Engineering (Fall 2009, Spring 2011, Spring 2014)

INQU6009 Colloids and Interfaces (Fall 2011, Fall 2013)

INQU6016 Advanced Transport Phenomena (Spring 2012, Spring 2013, Spring 2015, Spring 2016)

INQU6029/8996 Graduate Seminar (Spring 2009, Fall 2009, Spring 2010, Spring 2012, Fall 2012, Spring 2013, Fall 2013)

INQU8010 Special Topics in Transport Phenomena (Fall 2010, Fall 2013)