

Faculty



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Rank/Discipline

Assistant Professor
Industrial Pharmacy and
Pharmaceutics

Education & Specialty

Ph.D. Chemical Engineering,
University of Puerto Rico
Mayaguez, 2012. B.S. Chemical
Engineering, University of Puerto
Rico Mayaguez, 2006.

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Darlene I. Santiago Quiñones, Ph.D.

Research Areas and Active Projects

The research group focuses on the viscoelastic characterization of pharmaceutical melt formulations with the purpose of linking the viscoelasticity of the melt with its processing behavior when compounded using Hot Melt Extrusion (HME). Current research areas include (in terms of viscoelasticity and molecular mobility):

- Re-crystallization of API
- Material degradation
- Residence time distribution determination
- Batch size determination
- Chemometric models

The goal of the research is to connect fundamental research with pharmaceutical process understanding (QbD definition as per ICH Q10). The knowledge generated provides the necessary training for students in Puerto Rico and therefore future industry professionals that will introduce them to the modern manufacturing practices and will be able to provide the necessary support to the industry in Puerto Rico and worldwide. In addition, current industry employee's benefit from the knowledge gain, as training is available for process understanding.

Current research projects:

- Development of a HME chemometric model for the amorphous content and solid state of a drug when in presence of materials that inhibit (polymer) and or induce (surfactant) it's crystallization.
- Rheological characterization of drugs during crystallization from the undercooled melt state; impact of formulation components to molecular mobility and hence crystallization tendency.
- Development of a classification system for assessing the HME processing behavior of pharmaceutical amorphous dispersions when processed using HME in terms of the materials relaxation dynamics.
- Scientific collaborations with P.R. and U.S. pharmaceutical industries.

Publications

Santiago-Quinones, D. and Rinaldi, C., "Enhanced rheological properties of dilute suspensions of magnetic nanoparticles in a concentrated amphiphilic surfactant solution". *Soft Matter*, 8 (2012).

Baird, J. A., **Santiago-Quinonez, D.**, Rinaldi, C. and Taylor, L. S. Role of Viscosity in Influencing the Glass-forming Ability of Organic Molecules from the Undercooled Melt State. *Pharm. Res.* 29(1): 271-284 (2012).

Kestur, U. S., Lee, H., **Santiago, D.**, Rinaldi, C., Won, Y., and Taylor, L. S., "Effects of the Molecular Weight and Concentration of Polymer Additives, and Temperature on the Melt Crystallization Kinetics of a Small Drug Molecule". *Crystal Growth and Design*, 10 (2010).

Santiago-Quinones, D., Acevedo, A., and Rinaldi, C., "Magnetic and Magneto- Rheological Characterization of a Polymer Liquid Crystal Ferronematic." *Journal of Applied Physics* 105 (2009).

Calero-del C, V., **Santiago-Quinones, D.** and Rinaldi, C., "Quantitative Nanoscale viscosity measurements using magnetic nanoparticles". *Soft Matter*, 7 (2011).

Santiago-Quinones, D. I., Raj, K. and Rinaldi, C., A Comparison of the Magnetorheology of Two Ferrofluids with Different Magnetic Field-Dependent Chaining Behavior. *Rheologica Acta* (2013) 52: 719-726.

Presentations

"Molecular Mobility as a Tool for Understanding the Impact of Polyvinylpyrrolidone (polymer) and TPGS (surfactant) in Crystallization Kinetics of Amorphous Celecoxib", American Institute of Chemical Engineers (AIChE) 2015 Annual Meeting, Salt Lake City, Utah, November 12, 2015. Selected presentation for the AIChE Academy website.

"A New Lab for Pharmaceutical Formulation Rheological (flow) Process Understanding through Modeling/PAT Applications", IFPAC, San Juan Puerto Rico, June 18, 2014.

"A Rheological Study of Amorphous Celecoxib during Crystallization from the Undercooled Melt State", American Association of Pharmaceutical Scientists (AAPS) 2015 Annual Meeting, Orlando Florida, October 27th, 2015.

“Effect of PVP Polymer on Crystallization Growth of Pharmaceutical Drugs with Rheology”, ERC IAB Meeting, UPRM PR. March 2010.
“Rheological Characterization of Pharmaceutical Drugs”, ERC IAB Meeting, Rutgers NJ. November 2009.