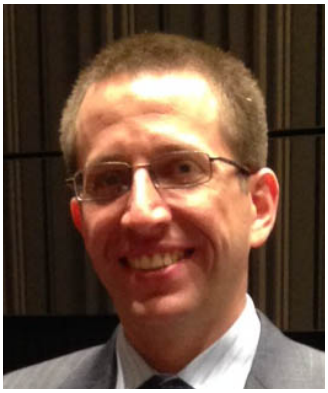
Department of Chemical Engineering Seminar Series

Dynamic Modeling of Colloidal Assembly



Daniel Beltran-Villegas
Postdoctoral Researcher, University of Michigan

Monday, February 9, 2015
Seminar: 4:00-5:00 p.m.
Physics Astronomy Building (PAA) A118
Reception: 3:30 p.m. – PAA A118

Abstract

Understanding concentrated colloidal dynamics in the presence of different pairwise interactions and external fields provides a basis to predict the temporal evolution of colloidal microstructures in diverse phenomena including suspension rheology and colloidal assembly. However, a microscopic theory of concentrated colloidal dynamics does not yet exist that rigorously includes both statistical mechanical (configuration dependent free energy changes) and fluid mechanical (configuration dependent multi-body hydrodynamic interactions) contributions. This work shows the implementation of a novel approach to model colloidal assembly by means of analyzing the temporal evolution of microstructures, that can be observed in experiments and simulation, with a small number of order parameters that describe the state of the system. This methodology is used to analyze the structure evolution of isotropic and anisotropic colloidal building blocks. Knowledge of these dynamic models enable the fundamental understanding of assembly systems, as well as the optimization, design and control of assembly systems to produce low-defect colloidal crystals.

Speaker Biography

Daniel Beltran-Villegas was born in Bogotá, Colombia. He received his BS in Chemical Engineering (2004) and MSc in Mechanical Engineering (2005) from Universidad de los Andes, where he worked as an undergraduate instructor in the department of Chemical Engineering until 2006. He received his Ph.D. at the Johns Hopkins University (Baltimore, MD) working with Prof. Michael A. Bevan in 2012. Since then, he is a Postdoctoral Research Fellow at the U of Michigan working with Prof. Ronald G. Larson. His research interests revolve around techniques for measuring of colloidal particle conservative and dissipative forces and modeling of dynamic assembly processes. In 2012 he received the 2nd place in the Langmuir Student Award competition held during the 86th ACS Colloids and Surface Science Symposium and in 2014 he received the Victor K. LaMer Award for graduate research in colloid and surface chemistry granted by the Colloids and Surface Science division of the American Chemical Society.