Texas Tech University
Department of Chemical Engineering
Seminar Schedule

Polymer Nanoparticle Composites for Bio-applications

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Abstract

Many high quality inorganic nanoparticle (e.g., quantum dots, superparamagnetic iron oxide nanoparticles) syntheses rely on organic media. Thus, unfortunately, phase transfer to aqueous media is required prior to application in biology. Although there are several strategies to introduce particles into aqueous media, including ligand exchange and silica encapsulation, modification with polymers is one of the most popular. These polymer-nanoparticle composites can consist of single nanoparticles coated with polymers along their surfaces or large aggregate structures with polymers segregated to compartments defined by polymer composition and nanoparticle solubility.

I will discuss our efforts to understand interactions between nanoparticles encapsulated in polymer micelles. In particular, I will discuss modes of fluorescence loss in quantum dot-polymer composites and best practices to minimize loss. Through cathodoluminescence and x-ray photoelectron spectroscopy, we have shown that polymer composition can influence aggregation and oxidation state of encapsulated quantum dots. Further, I will discuss how the mode of micelle synthesis (e.g., shorter polymer aggregation time vs. nanoparticle aggregation time) yields different structures with regards to quantum dot fluorescence. Finally, I will discuss the role of packing and ordering within these composites on fluorescence performance, and extending this work to superparamagnetic iron oxide nanoparticles, the influence of applied magnetic fields on that ordering.

Bio

Dr. Jessica Winter is a professor in the departments of Chemical and Biomolecular and Biomedical Engineering at The Ohio State University. Dr. Winter joined the faculty in 2006. She completed her graduate work under the guidance of Dr. Christine Schmidt (BME) and Dr. Brian Korgel (ChE) at the University of Texas at Austin in the area of biological nanoparticles. Her postdoctoral work was performed at the Center for Innovative Visual Rehabilitation, a collaborative effort between Harvard Medical School and MIT to develop a prosthesis to restore lost visual function. Her work, conducted under the supervision of Dr. Joseph Rizzo, III (Ophthalmology, Harvard Medical) and Dr. Stuart Cogan (EIC Laboratories, Norwood, MA) examined the application of tissue engineering techniques to neural prosthetic devices.

Friday, March 1
3:00 pm
Livermore 101