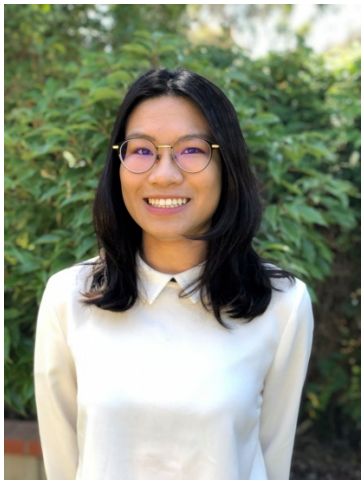
UCLA College | Physical Sciences Chemistry & Biochemistry

Chem 218: Student Exit Seminar

"Superparamagnetic Core/Shell Mesoporous Silica Nanoparticle for Magnetic Heating-Induced Anticancer Drug Delivery"

By Fang-Chu Lin
Prof. Jeffrey Zink Group

ABSTRACT: Superparamagnetic iron oxide nanoparticles (SPION) generate heat in the presence of an alternating magnetic field (AMF) and are used in clinics to treat cancers. Mesoporous silica nanoparticles (SPION@MSN) embedded with SPION possess the advantageous features of both the SPION core and the shell, i.e., localized magnetic heating and a high payload of various cargo molecules such as anticancer drugs, respectively. This talk focuses on the development of SPION@MSNs as a heat-activated drug delivery platform in which the precise drug release can be directly controlled by using AMF. To expand our knowledge base in this application, we first study the local heating mechanism of a SPION in suspension and in MSN. We carried out this investigation by using fluorescence depolarization based on detecting the mobility-dependent polarization anisotropy of two luminescence emission bands corresponded to the luminescent SPION core and the shell of the SPION@MSN. Utilizing the magnetic heating, we then designed a magnetically activated and enzyme-responsive SPION@MSN vehicle with extra-large pores to deliver and release anticancer peptides on-demand. We demonstrate that a SPION core can act as a nano-heater to stimulate a cascade drug release and high tumor-targeting/inhibiting efficiency can be achieved. Altogether, these works show the full potential of AMF-controlled core/shell nanoparticle vehicles for a more selected and precise dosage control.



Thursday, April 22, 2021
12:00 p.m.
Via Zoom

For questions, please contact: jzabala@chem.ucla.edu