

UCSD NANOENGINEERING/CHEMICAL ENGINEERING
Distinguished Seminar

Tuesday, August 27, 2019

Seminar Presentation: 11:00am – 12:00pm

SME room 248

*“Nanolayered Drug Release Systems for
Regenerative Medicine and Targeted Nanotherapies”***Paula T. Hammond Ph.D.***David H. Koch Chair Professor of Engineering
at the Massachusetts Institute of Technology,
and the Head of the Department of Chemical Engineering*

Abstract: Alternating electrostatic assembly is a tool that makes it possible to create ultrathin film coatings that contain highly controlled quantities of one or more therapeutic molecules within a singular construct. These release systems greatly exceed the usual ranges of traditional degradable polymers, ranging from 10 to as high as 40 wt% drug loading within the film. The nature of the layering process enables the incorporation of different drugs within different regions of the thin film architecture; the result is an ability to uniquely tailor both the independent release profiles of each therapeutic, and the order of release of these molecules to the targeted region of the body. We demonstrate the use of this approach to release or present signaling molecules such as growth factors and siRNA and DNA to regulate genes to facilitate tissue regeneration in-situ, address soft tissue wound healing, deliver vaccines from microneedle surfaces, or administer targeted nanotherapies that are highly synergistic for cancer treatments. New developments in targeted cancer therapies for ovarian, lung and brain cancers will be addressed. Translation of these concepts to nanomaterials design for the penetration of difficult physiological barriers, including cartilage penetration for osteoarthritis, will be described.

Biosketch: Professor Paula T. Hammond is the David H. Koch Chair Professor of Engineering at the Massachusetts Institute of Technology, and the Head of the Department of Chemical Engineering. She is a member of MIT's Koch Institute for Integrative Cancer Research, the MIT Energy Initiative, and a founding member of the MIT Institute for Soldier Nanotechnology. Her research in nanomedicine encompasses the development of new biomaterials to enable drug delivery from surfaces with spatio-temporal control. She also investigates novel responsive polymer architectures for targeted nanoparticle drug and gene delivery, and has developed self-assembled materials systems for electrochemical energy devices. Professor Paula Hammond is a member of the National Academies of Sciences, Engineering and Medicine, and the American Academy of Arts and Sciences. She is also the recipient of the 2013 AIChE Charles M. A. Stine Award, which is bestowed annually to a leading researcher in recognition of outstanding contributions to the field of materials science and engineering, and the 2014 AIChE Alpha Chi Sigma Award for Chemical Engineering Research. She has designed multilayered nanoparticles to deliver a synergistic combination of siRNA or inhibitors with chemotherapy drugs in a staged manner to tumors, leading to significant decreases in tumor growth and a great lowering of toxicity. Professor Hammond has published over 320 papers, and over 20 patent applications. She is the co-founder and member of the Scientific Advisory Board of LayerBio, Inc. and a member of the Scientific Advisory Board of Moderna Therapeutics.