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FEBRUARY 19-25, 2017

Wednesday, February 22, 2017 | Raytheon Amphitheater | 12:00pm

Hosted by Northeastern's Department of Chemical Engineering

DISTINGUISHED SEMINAR:

Nanolayers for Drug Delivery: From Cancer to Wound Healing

Dr. Paula T. Hammond

MIT, Department of Chemical Engineering

The alternating adsorption of oppositely charged molecular species, known as the electrostatic layer-by-layer (LBL) process, is a simple and elegant method of constructing highly tailored ultrathin polymer and organic-inorganic composite thin films. We have utilized this method to develop thin films that can deliver proteins and biologic drugs such as growth factors with highly preserved activity from surfaces with sustained release periods of several days; manipulation of the 2D composition of the thin films can lead to simultaneous or sequential release of different components, resulting in highly tunable multi-agent delivery (MAD)nanolayered release systems for tissue engineering, biomedical devices, and wound healing applications. Depending on the nature of the LbL assembly, we can generate thin films that rapidly release proteins or peptides within minutes for rapid hemostasis, or release growth factors and small molecule therapeutics such as anti-inflammatory drugs from weeks to several months. The LbL approach can be adapted to the modification of nanoparticle surfaces to introduce mediated interactions with cells that lead to uptake of the nanoparticle, release of drugs in specific regions, and targeting of the nanoparticle to cancer cells. These polyelectrolyte nanolayer assemblies can be generated to increase the half-life of the particle in the bloodstream by preventing adsorption of proteins via hydrated outer layers, and can also act as a sheddable "stealth" layer that prevents recognition of the particle as a foreign body by the body's defense systems, and a means of staged delivery. It is possible to design nanoparticles that consist of several nanolayers wrapped around a drug loaded core particle to allow the combination release of siRNA to lower the defenses of cancer cells and chemotherapeutics in a time-dependent fashion that enables cancer cell killing effects in difficult to treat tumors.

Professor Paula T. Hammond is the David H. Koch Chair Professor of Engineering and the Department Head of the Chemical Engineering Department at the Massachusetts Institute of Technology, as well as a member of MIT's Koch Institute for Integrative Cancer Research. Her research in nanotechnology encompasses the development of new biomaterials to enable drug delivery from surfaces with spatial and temporal control. She investigates novel responsive polymers for targeted nanoparticle drug and gene delivery. Professor Hammond was elected into the 2013 Class of 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, the AIChE Alpha Chi Sigma Award for Chemical Engineering Research and the Department of Defense Ovarian Cancer Teal Innovator Award.

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