SEMINAR ANNOUNCEMENT

Joint Seminar by Department of Chemistry and NUSNNI

Electrostatics Driven Assembly of Hybrid Functional Thin Films for Biomaterials and Electrochemical Devices

Professor Paula T Hammond
Bayer Professor of Chemical Engineering
Massachusetts Institute of Technology
United States of America

Date: 26 July 2006 (Wednesday)
Time: 3.00 pm
Venue: LT31, S16, Level 3
Faculty of Science, NUS

Abstract

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 a number of functional ultrathin film systems, including materials that can be tailored for biomaterials surfaces, cell templating, display, sensor and delivery applications. These systems have allowed the formation of a range of electrochemical devices using multilayer assembly, including the use of conjugated polymers and inorganic nanoparticles for electrochromic displays, the formation of thin films as proton exchange membranes in fuel cells, and the use of these multilayers in other power and micropower devices. New explorations have included the use of some of these unique redox active nanoscale systems as systematically deconstructible polymers in multilayers with potential uses as an electrochemical means of drug delivery. We discuss the application of these functional thin films toward a number of device systems at the interfaces between electroresponsive systems, nanoscience and biology.

Means of creating ordered virus-polymer thin film assemblies will be discussed, and collaborations at MIT in which these viruses are genetically engineered to support the generation of metal and metal oxide coatings will be described. In these systems the use of electrostatic assembly methods leads to the spontaneous assembly and ordering of viruses at the top surfaces of functional polyelectrolyte multilayers. The protein coats of the viruses act as templates to form Au, Co and CoO nanowires that can be used to make a number of interesting electrochemical functions, including battery electrodes with extraordinarily high capacity.

About the Speaker

Professor Paula T. Hammond is the Bayer Professor of Chemical Engineering at the Massachusetts Institute of Technology. Paula Hammond earned her S.B. in Chemical Engineering from the Massachusetts Institute of Technology in 1984, her M.S. degree from Georgia Institute of Technology in 1988, and her Ph.D. in Chemical Engineering in 1993 from the Massachusetts Institute of Technology. In 2000, Professor Hammond was awarded the Junior Bose Faculty Award at MIT. She has also received the NSF Career Award, the EPA Early Career Award, the DuPont Young Faculty Award, and the 3M Innovation Fund Award, and is on the Advisory Board of the journals *Advanced Materials* and *Chemistry of Materials*. She was recently a 2003 Radcliffe Fellow at Harvard University. Dr. Hammond was one of a core group of founding faculty members involved in the planning and development of the Institute for Soldier Nanotechnologies (ISN) at MIT, a program funded by the US Army and directed toward new technologies involving nanostructured materials for the protection of the soldier.

Professor Hammond's research and educational program emphasizes the use of molecular aspects in the study and development of new materials and processes. Her general areas of interest include electrical and optical properties of polymers, biomaterials, and nano to microscale fabrication using directed and self-assembly of polymers. Her research program on self-assembling polymeric systems and directed assembly and patterning includes ultrathin patterned polymer films, liquid crystalline polymers and block copolymers. More recent applications investigated in her group include ultrathin film systems for microbatteries and fuel cells, drug delivery and cellular templates for biomaterials.

Host: Asst Prof Valiyaveettil, Suresh

All are Welcome