Michigan Institute for Plasma Science and Engineering Seminar

Plasma Polymerization of Biocompatible Thin Films: Applications of rf Plasmas in Biomedical Engineering

Prof. Heather E. Canavan
University of New Mexico

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Abstract

Plasma polymerization offers a variety of benefits in the field of biomedical engineering: the process is capable of creating a conformal, uniform thin film from a variety of monomers in a manner that is both sterile and compatible with many surface chemistries and geometries. These benefits are of great interest in the field of biomaterials, the study of interactions between biological materials and manufactured substrates. Biomaterial interactions are critical to the understanding of problems ranging from biologically-induced corrosion of ship hulls to the rejection of implant materials in the human body. Although the mechanisms by which surface character influences cell survival are as yet unknown, the proteins in the extracellular matrix (ECM) are thought to play a critical role via mediation of the cellular response to the substrate surface. Typically, the removal of cells from culture substrates requires harsh methods such as enzymatic digestion or physical scraping, which damage the morphology and function of cells. Plasma polymerization of *N*-isopropyl acrylamide (ppNIPAM) offers a particularly promising system for the study of cell/surface material interactions, as adherent cells spontaneously detach as a sheet below the transition temperature of this thermoresponsive polymer. Until now, this behavior has been empirically observed, but the underlying mechanisms for this response have not been understood. Our research focuses on the thorough examination of the cellular response using both biological and surface science techniques. In this way, we aim to understand the mechanism by which this harvest technique works at the fundamental level, and thereby guide the rational design of the next generation of engineered devices.

About the Speaker: **Heather Canavan is an assistant professor in the Dept. of Chemical and Nuclear Engineering and the Center for Biomedical Engineering at the University of New Mexico. She received her PhD in Physical Chemistry from George Washington University in 2002, after which she held a postdoctoral fellowship in the Chemical and Bioengineering Departments at the University of Washington under the guidance of Profs. David Castner and Buddy Ratner. The focus of Heather's research is novel use of surface science techniques in Biomedical Engineering, including the plasma polymerization of biomaterials as novel cell culture substrates for biosensor and tissue engineering applications. She publishes in journals such as *Langmuir*, *Plasma Processes and Polymers*, and *Biomaterials.* Recently, her research was highlighted as a Feature Article and cover of *Langmuir*.**