Food for the Twenty-First Century
Bioprocessing and Biosensing Center

Spring 2013 Seminar Series

PRESENTER: Dr. Heather McCaig, Caltech Postdoctoral Researcher
NASA Jet Propulsion Laboratory (JPL)

TITLE: Next Generation Chemical Sensing in Air and Water

ABSTRACT:
High-quality chemical analysis for food safety, national security, and environmental monitoring is currently restricted to the laboratory, where the use of expensive bench-top equipment and highly-trained operators are available. To overcome these limitations, a variety of new sensors are being developed to make chemical detection available on-site, and at lower cost. For example, nano-scale electronic nose systems, using resonant nanocantilevers, could enable chemical vapor detection to be incorporated into smartphones. Alternatively, novel materials, such as inverse opal hydrogels, have the potential to advance detection technology for bacterial endospores. In this seminar, we will discuss novel ways to design and develop such sensors using a variety of state-of-the-art examples. From a device perspective, I will show how arrays of polymer-coated nano-scale sensors can be designed to perform on par with well-studied macro-scale sensors. From a chemistry and physics perspective, I will discuss how novel surface treatments, such as surface initiated polymerization can be used to enhance both the sensitivity and the repeatability of nano-scale sensors. Lastly, I will explore how novel material properties can be exploited to create material classes capable of behaving as a sensing platform. This work provides insight into the key design parameters, such as the nano-scale sensor shape and polymer properties, that must be optimized to make nano-scale sensors a competitive technology for real-world biochemical sensing and analysis, whether in the air or in the water.

BIOGRAPHICAL:
Dr. McCaig received her H.B.S. in Chemical Engineering from Oregon State University (2004), and then her M.S. in Chemical Engineering (2007) and Ph.D. in Chemistry (2012) from the California Institute of Technology while working in the research group of Prof. Nathan Lewis. She is currently a Caltech postdoctoral researcher working at NASA's Jet Propulsion Laboratory (JPL) with Dr. Adrian Ponce on novel materials for the detection of viable bacterial endospores.

DATE • TIME • LOCATION:
Tuesday March 12, 2013, 4:00 PM, 105 Agricultural Engineering Building

The Food for the 21st Century (F21C) program at the University of Missouri (MU) was established in the mid-1980s through state funding. The overall goal of the program is to help Missouri food producers and processors maintain their competitive edge in the global marketplace by conducting cutting-edge research in a number of food-related areas. The program involves faculty researchers from multiple colleges including College of Agriculture, Food and Natural Resources; College of Arts and Sciences; College of Engineering; School of Medicine; College of Human Environmental Sciences; and College of Veterinary Medicine. Based on the research emphases, the researchers are grouped into four Clusters: Plant Biotechnology; Animal Reproduction; Bioprocessing and Biosensing Center; and Human Nutrition.

Bioprocessing and Biosensing Center was formed in 1986. The Center currently consists of 27 faculty members, plus collaborators, support staff, and graduate students from six departments in the College of Agriculture, Food and Natural Resources and College of Engineering. These departments include Biological Engineering; Food Science; Animal Sciences; Chemical Engineering; Electrical Engineering; and Mechanical and Aerospace Engineering. This seminar is one of the educational activities in the Bioprocessing and Biosensing Center.

Cluster Co-Leaders: Drs. Fu-hung Hsieh and Jinglu Tan
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