FIU Biomedical Engineering
FLORIDA INTERNATIONAL UNIVERSITY

Biomedical Engineering
Wallace H. Coulter Foundation
Lecture Series

WALLACE H. COULTER Foundation

Ink-Jet Printing of Sol-Gel Derived Bioinks to Produce Bioactive Paper Sensors for Environmental and Biomedical Analysis

Dr. John D. Brennan
Department of Chemistry & Chemical Biology,
McMaster University, Canada

Friday, Nov 1, 2013
LECTURE: 9:00 AM - 10:00 AM

ENGINEERING CENTER
ROOM EC 2300
10555 WEST FLAGLER STREET
MIAMI, FL 33174

Abstract: Bioactive paper-based diagnostic sensors have recently gained attention as a platform for rapid and inexpensive analysis in a field setting. In this presentation, the use of ink-jet deposition of reagents onto paper-based lateral flow devices, and the use of such devices for toxin, heavy metal and pathogen detection will be described. The first example will focus on the use of a reagentless bioactive paper-based solid-phase biosensor for detection of acetylcholinesterase (AChE) inhibitors, including organophosphate pesticides, with detection limits in the low to sub-nanomolar range using a 5 min analysis time. Recent developments including high-throughput printing of test strips and development of on-strip valves and novel hydrophobic barrier chemistries will be highlighted. The second example will describe multianalyte test strips that can detect a series of heavy metals based on inhibition of enzymes within specific test zones. A third example describes a novel lateral flow colorimetric paper sensor for detection of E.coli using the intracellular enzymes, b-glucuronidase (GUS) or b-galactosidase (GAL). The assay protocol involves selective magnetic preconcentration of specific E. coli strains, including H7:O157, followed by lysis of cells and detection of GUS or GAL on paper, and provides detection limits in the range of 25 cfu/mL in 5 min, <1 CFU/mL with ~3 h of culturing, and better than 1 CFU in 100 mL of water after 8 h of culturing. Recent results involving scale up of printing using conventional office printers and validation studies of bacterial test strips will be presented.

Biography: John D. Brennan was born in 1965 in Toronto, Canada. He obtained B.Sc. (1989), M.Sc. (1990) and Ph.D. (1993) degrees in analytical chemistry from the University of Toronto, where he worked with Prof. Ulrich J. Krull on the development of fluorescence-based fiber-optic biosensors. In 1993 he joined Prof. Arthur G. Szabo's research group at the National Research Council of Canada (Institute for Biological Sciences), where he did resarch into protein dyanmics and stability using time-resolved fluorescence methods. In 1995 he joined the Department of Chemistry at Brock University in Canada, and moved to his current position at McMaster University in 1998. He is currently a Professor in the Department of Chemistry & Chemical Biology at McMaster University, Director of the Biointerfaces Institute and holder of the Canada Research Chair in Bioanalytical Chemistry and Biointerfaces. His current research involves high throughput methods to prepare and characterize new biocompatible sol-gel materials, the entrapment of biomolecules and cells within sol-gel derived materials for the development of bioanalytical assays and devices, and fundamental studies of entrapped biomolecules using mass spectrometry and fluorescence methods.

Contact: bmeinfo@fiu.edu; 305-348-6717
Map: http://campusmaps.fiu.edu/Engineering Center