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Department of Chemistry

Seminar

9:45 a.m. Thursday, April 24, 2014 • 331 Smith Hall

Professor

Shana Kelley

Department of Chemistry and Biochemistry
University of Toronto



Ultrasensitive Biomolecular Detection Using Nanostructured Metals

Research interests: develop new molecules and devices that monitor biological activity; use molecular probes to monitor processes occurring within cells; and develop devices that can measure levels of biomarkers.

Website: <http://www.kelleylaboratory.com/shana-kelley.html>

Abstract

The analysis of panels of molecular biomarkers offers valuable diagnostic and prognostic information for clinical decision making. Robust, practical platforms that detect low levels of biomolecules (< 1000 copies) are urgently needed to advance medical care by diagnosing and predicting the progression of cancer and other disease states. Electrochemical methods providing low cost and direct biomarker read-out have attracted a great deal of attention for this application, but have, to date, failed to provide clinically-relevant sensitivity. We exploit controlled nanostructuring of electrode surfaces to promote surface accessibility and enhance capture rate and efficiency to solve this long-standing problem, and showed that the nanoscale morphologies of electrode surfaces control their sensitivities.¹ In addition, we have worked towards integrating nanomaterials-based electrodes into a chip-based platform to facilitate multiplexed analysis in a robust, practical format.² Recently, we have developed assay that are able to detect nucleic acids, proteins and small molecules, with universally high sensitivity levels.^{3,4} Our efforts to use these components to detect markers in clinical samples to develop tests for infectious disease diagnosis, oncological management and transplant medicine will be featured in this lecture.⁵⁻¹⁰

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3. J. Das, K.B. Cederquist, P. Lee, E.H. Sargent, S.O. Kelley, *Nature Chemistry*, **2012**, *4*, 642.
4. A. Bhimji, A. Zaragoza, L. Live, S.O. Kelley, *Analytical Chemistry*, **2013**, *85*, 6813-6819.
5. L. Soleymani, Z. Fang, B. Lam, X. Bin, E. Vasilyeva, A. Ross, E.H. Sargent, S.O. Kelley, *ACS Nano*, **2011**, *5*, 3360.
6. J. Das & S.O. Kelley, *Analytical Chemistry*, **2011**, *83*, 1167.
7. H. Yang, A. Hui, G. Pampalakis, L. Soleymani, F.-F. Liu, E. H. Sargent, S.O. Kelley, *Angewandte Chemie*, **2009**, *48*, 8461.
8. B. Lam, Z. Fang, E.H. Sargent, S.O. Kelley, *Analytical Chemistry*, **2012**, *84*, 21
9. J.D. Besant, J. Das, E.H. Sargent, S.O. Kelley, *ACS Nano*, **2013**, *7*, 8183.
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Host: Valerie Pierre

Refreshments will be served prior to the seminar.