

3rd International Conference and Exhibition on **Biosensors & Bioelectronics**

August 11-13, 2014 Hilton San Antonio Airport, San Antonio, USA

Molecular sensing based on optical whispering-gallery mode microsensors

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In this plenary/keynote talk, we will discuss optical whispering-gallery modes (WGM) resonance and its applications in nanoscale detection and molecular level sensing. The sensing principle is either an evanescent electromagnetic field interacts with target biomolecules adsorbed or covalently attached to the microsensor surface or a resonant field interacts with target molecules trapped inside a resonator, and consequently induces changes in the optical resonance spectrum. For example, a porous ring microresonator integrated in a microelectrofluidic system can function as both a filter and an optical WGM sensor. The microelectrofluidic forces augment substantially the filtration capability of the system, which separates the target molecules from solution and enriches the analyte deposition inside the porous resonator. This alters the optical properties of the resonator and shifts the optical WGM resonance frequency, leading to potential label-free ultrasensitive detection of small molecules at picomolar concentration levels and below.

Biography

Zhixiong Guo is a Professor at Rutgers, The State University of New Jersey, and a Fellow of American Society of Mechanical Engineers. He holds a doctorate in both Engineering Physics and Mechanical Engineering. His specialty lies in the modeling and experimental analysis of radiation-matter interactions and applications in nanoscale optical sensing, lasers in biomedicine, and thermal management. He first proposed detection of single bio/chemical molecules using optical whispering-gallery modes in early 2005. He has published more than 80 papers in reputed journals. He is serving as an associated editor for Journal of Heat Transfer, and Heat Transfer Research, an editor for Journal of Optical Engineering and Applications, and editorial board member of several reputed journals.

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