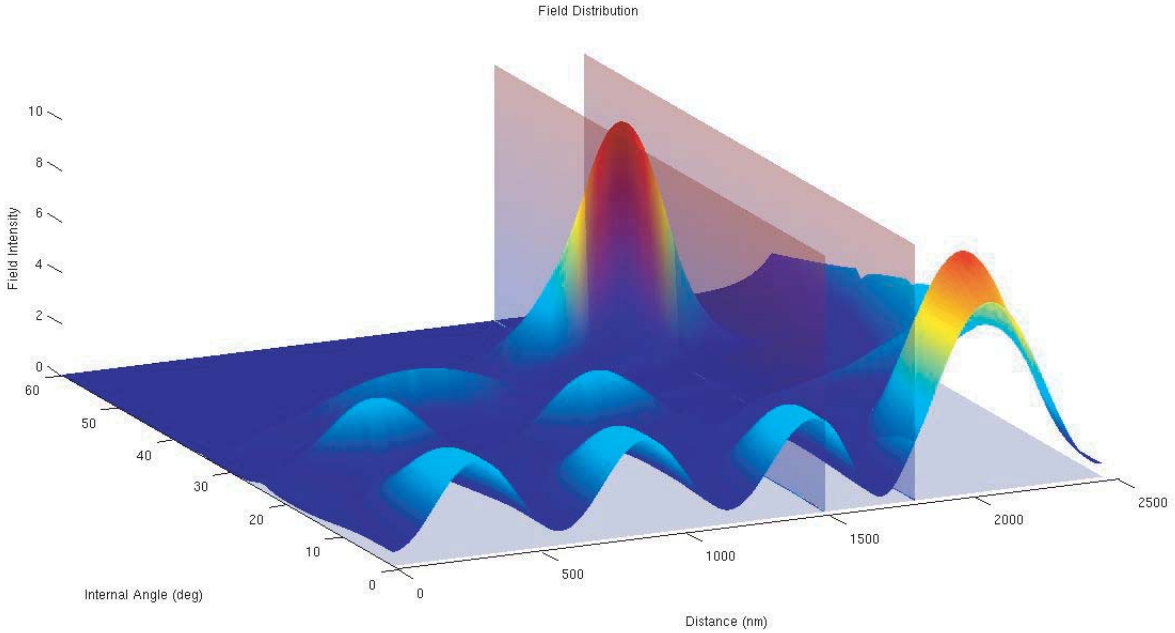
The Institute of OPTICS

Colloquium

University of Rochester

Detection of Nanoscale Molecules in Nanoscale Holes



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BS, MS, and PhD Optics U of R

This talk will describe the use of porous materials with nanoscale holes as biomolecular sensors. Selective detection of DNA oligonucleotides in 20-100 nm holes will be reported with corresponding simulations showing good agreement with experiment.

3:00 pm, Monday, September 15, 2008
Sloan Auditorium, Goergen Building
Refreshments provided

Detection of Nanoscale Molecules in Nanoscale Holes

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Abstract

Porous materials offer several advantages for molecular sensing applications due to their large available surface area and size-selective filtering capabilities. Many traditional sensors struggle to achieve low detection limits for small molecules due to their limited surface area. Generally, the sensitivity of an optical biosensor scales with the percentage of light-matter interaction between the electromagnetic field and the biomolecules to be detected. The use of porous materials enables a significant increase in the overlap of the optical field and biomolecules. This talk will examine field distributions and associated detection sensitivities of several evanescent wave and guided wave-based sensors. Special attention will be given to silicon-based sensor systems with nanoscale holes, including waveguides and photonic crystal structures. Methods of determining the optimum size ratio between the air holes of the sensor and the molecules to be detected will also be discussed. There is a tradeoff between ease of infiltration, magnitude of the sensor signal change, and scattering losses. Selective detection of DNA oligonucleotides in 20-100 nm holes will be reported using straightforward fabrication and measurement conditions. Corresponding simulations, showing good agreement with experimental results, will also be reported.

Biography

Sharon M. Weiss graduated with B.S. (’99), M.S. (’01), and Ph.D. (’05) degrees in Optics from the University of Rochester. Her graduate studies were supported in part by NDSEG and Sproull fellowships. Dr. Weiss is currently an Assistant Professor of Electrical Engineering and an Assistant Professor of Physics at Vanderbilt University. Her research is focused primarily on silicon-based biosensing with resonant structures and white-light emission from encapsulated CdSe nanocrystals. Dr. Weiss has over 30 publications and 1 patent. She also recently received an NSF Faculty Early Career Development (CAREER) award.