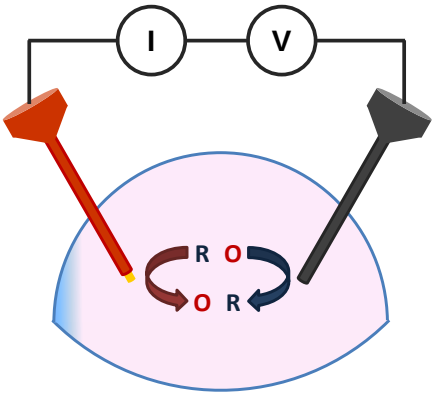
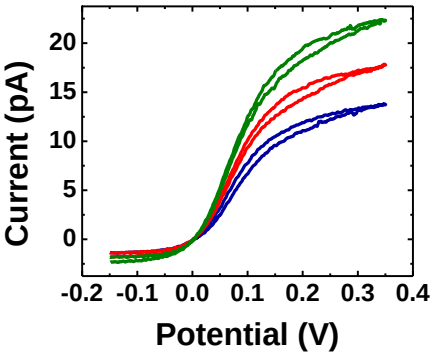
NANOHOUR

Wednesday, February 24th, 2010 at 3:00 pm
Beckman Institute - Room 3269

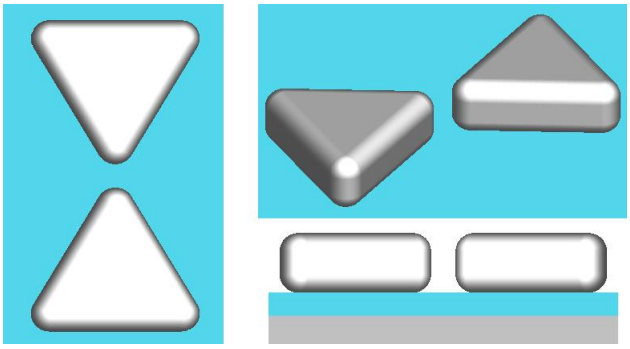
Nanotube-Based Needle Nanoprobes for Electrochemical Sensing in Microenvironments

Dr. Kyungsuk Yum, MechSE





Nanoscale electrodes capable of probing microenvironments provide new opportunities for nanobiotechnology. For example, nanoscale electrodes have enabled novel biological studies, including the study of intracellular electrochemical reactions and signaling processes that occur inside living cells or in the cellular network. In this talk, I will present the fabrication and characterization of individual nanotube-based needle-like nanoprobes and their applicability for electrochemical sensing in microenvironments. The voltammetric behavior of the nanoprobe in microdroplets with a volume of a few picoliters reveals a new electrochemical mechanism in confined microenvironments: the redox-active molecules can be regenerated and dominate the electrochemical reaction at the reference electrode, establishing a stable reference potential. I will also discuss the potential application of the needle-like nanoprobe as a multifunctional tool for studying biology with high spatial and temporal precision in living cells.



Investigation of the Nonlinear Optical Response from Arrays of Gold Bowtie Nanoantennas

Kaspar Ko, MechSE

Recent investigations into the optical response of bowtie nano-antennas (BNAs) has established the tip-to-tip triangle configuration as promising for applications such as photonic circuits, super-resolution imaging, and single molecule detection. They have been shown to exhibit higher localized field enhancement and better spatial confinement than other coupled-plasmon resonant-nanoparticle pair geometries. More interestingly, BNAs have been shown to enhance nonlinear processes such as second harmonic generation (SHG) and two-photon fluorescence (TPF) due to these local field enhancements. Here, we report on the behavior of SHG and TPF from arrays of gold BNAs with respect to array spacing, incident polarization, and incident wavelength using a stochastically scanned ultra-fast laser focused to a diffraction limited spot. We observe that the nonlinear emission from BNAs can be modified by these parameters, which strongly supports their use in next-generation technologies.

Coffee, tea, and cookies will be served!

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