ANALYTICAL SEMINAR

Electrochemically Modulated iSCAT for Single Channel Analysis

Callum Appel

Graduate Student
Purdue University

Interferometric scattering microscopy (iSCAT) enables label-free detection of molecules with diameters as low as 5 nanometers, making it ideal for imaging the movement of small intra- and extracellular proteins. iSCAT monitors the interference pattern of the reference beam and the scattering caused by light interacting with the targets of interest. Using a CMOS for detection allows for the high spatial resolution and temporal resolution limited to the speed of the camera used. When combined with electrochemical modulation (EM), iSCAT gains chemical specificity, applied voltages modulate surface charge density and regulate the opening and closing of specific types of ion channels within the cell membrane. This analytical tool provides an optical approach for the in depth studying of various types of cells and ion channels, especially the signaling between neurons in vitro.

Tuesday, September 30, 2025 | 3:30 pm | WTHR 172

PURDUE UNIVERSITY | James Tarpo Jr. and Margaret Tarpo Department of Chemistry

ANALYTICAL SEMINAR

Design advancements in two-photon fluorescent molecular probes applied to disease target detection and imaging

Meghan Cortez

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Biological imaging for disease diagnostics is valuable for motoring how diseases progress and understanding where they manifest within the body. Fluorescence imaging is a powerful technique due to the accessibility of commercial instrumentation; however single photon fluorescence dyes and probes, which are most common, suffer from limited imaging depths (10 – 100 μm) reducing its use for in vivo applications. Two-photon fluorescent molecular probes with high specificity and selectivity for a particular disease target can image the presence of disease markers with great depth (1 – 2 mm) for in vivo and clinical analyses. Novel, unique probes for disease diagnostics are being engineered for fast detection of chemical and physical targets using accessible commercial instrumentation.

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ANALYTICAL SEMINAR

The Vibes Are Off: Wavelength-Shift Localized Surface Plasmon Resonance for Quick Biosensors.

Thomas Lubinsky

Graduate Student
Purdue University

In certain materials, a phenomenon occurs when incident light produces a coherent oscillation of free charge carriers on the surface, known as Surface Plasmon Resonance (SPR). The conditions under which resonance is achieved are dependent on the dielectric constant on both sides of the surface, which includes the sample-side; hence, small changes to the dielectric environment can be detected in real-time. Localized Surface Plasmon Resonance (LSPR) extends this principle to nanosensors, with dimensions smaller than the wavelength of incident light and often conjugated to a receptor ligand. Here, the plasmon oscillates around the metallic component of the nanosensor at a frequency dependent on the local dielectric environment, which changes upon analyte binding to the surface bound receptor. For LSPR, this is frequently measured as a shift in the wavelength of maximum extinction in the UV-Vis spectrum. We will cover how innovations of the LSPR technique have been developed for fast detection in targeted assays, with use cases ranging from COVID-19 viral particles to antimicrobial resistance genes.

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