

ANALYTICAL SEMINAR

From Microns to Millimeters: OBM as a Tool for Deep Biological Tissue Imaging

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Imaging biological tissues is essential for understanding their structure and function. Traditionally, Differential Interference Contrast (DIC) microscopy is utilized for this purpose, however due to a reliance on transillumination to create contrast, samples are limited to 100-200 microns, establishing a need for an imaging technique for thick biological tissue samples. Oblique Back-Illumination Microscopy (OBM) addresses these challenges by generating phase-gradient images with enhanced contrast and depth resolution enabling the imaging of thick scattering tissues. Its compatibility with miniaturized systems, such as endoscopes, further extends its applicability to in vivo and clinical settings. By overcoming the depth and scattering limitations of traditional methods, OBM provides a versatile and powerful tool for non-invasive imaging of complex biological tissues.



Tuesday, February 11, 2025



3:30 pm



WTHR 320

ANALYTICAL SEMINAR

Liquid Crystal-Based Sensors for Real-Time Chemical Measurements

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Liquid crystal (LC) is state of matter that retains both the fluidity of liquids and orientation order of solid crystals. The unique properties of LC materials have most notably been utilized in liquid crystal displays, but they have also been integrated into chemical sensors as transducers. The physical orientation of LC molecules is highly sensitive and quick to respond to external stimuli, which is leveraged in applications that benefit from real-time measurements. The orientational transitions of LC molecules alter the optical and electrical properties, which are measured as the LC responds to chemical stimuli. At the LC/sample interface, chemical modifications are incorporated to increase specificity to the analyte of interest. LC orientational changes at the interface are amplified to the bulk LC, based on the unique characteristic of long-range orientational order alignment and leads to high sensitivity. These aspects can be applied to a variety of research fields such as studying protein folding and the development of point-of-care devices.



Tuesday, February 11, 2025



3:30 pm



WTHR 320

ANALYTICAL SEMINAR

Advancements in Multiplexed Photoelectrochemical Biosensors: Using pH Changes for Multianalyte Detection

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Photoelectrochemical (PEC) biosensors have seen a rapid development in the last few years due to their high sensitivity, low cost, and ease of miniaturization.^{1,2} Recently, there has been a shift towards the development of PEC sensors that allow for the detection of multiple analytes.^{1,3} The key challenge in designing these multiplexed sensors is avoiding cross-interference from the other analytes.^{3,4} Previous advancements in this field have focused on increasing wavelength, potential, or spatial-resolution to allow for the detection of different analytes with the same sensor.³ However, it is often difficult and time-consuming to design and fabricate these sensors.⁵ One emerging strategy for multiplexed PEC sensors is the use pH dependent materials to modify the input signal and allow for the detection of multiple analytes on a single interface.^{1,4,5} When the local environment of the biosensor changes from acidic to basic, short strands of DNA, referred to as i-motifs, experience a conformation change, resulting in a change in electron transfer through the sensor.^{4–6} The use of these pH-based conformational changes has expanded the ability for multianalyte detection with PEC sensors.^{4,5}



Tuesday, February 11, 2025



3:30 pm



WTHR 320

References

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