ANALYTICAL SEMINAR

Bridging Targeted and Nontargeted PFAS Detection: From TOP Assay Refinements to IMS-MS Advances

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Per- and polyfluoroalkyl substances (PFAS) pose significant environmental and analytical challenges due to their persistence, widespread contamination, and potential health risks .[1,2] This seminar explores two innovative advancements in PFAS detection. First, an improved Total Oxidizable Precursor (TOP) assay enhances the quantification of hidden PFAS precursors, including ultrashort-chain compounds, by integrating an oxidation efficiency indicator.[3] This refinement increases accuracy in environmental monitoring by addressing previously undetected PFAS in landfill leachate and wastewater.[3,4] Second, a nontargeted ion mobility spectrometry-mass spectrometry (IMS-MS) approach enables the discovery of novel PFAS with greater structural resolution and sensitivity.[5] This method has successfully identified previously unreported PFAS in environmental samples near fluorochemical manufacturing sites.[5,6] Together, these techniques offer a more comprehensive picture of PFAS contamination, bridging the gap between known and emerging pollutants and advancing analytical capabilities for environmental monitoring.[3,5,7]

Tuesday, March 25, 2025 | 3:30 pm | WTHR 320

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ANALYTICAL SEMINAR

Charge Carrier Dynamics and Stability in Perovskite Solar Cells: Insights from TRPL

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Perovskite solar cells (PSCs) have achieved a significant increase in power conversion efficiency (PCE), rising from 3.8% to 26.1% over the past decades. In addition to their impressive efficiency, PSCs offer low manufacturing costs and solution processability. However, despite these advancements, poor long-term stability remains a major barrier to their commercialization. Understanding charge carrier dynamics is crucial for optimizing both the efficiency and stability of PSCs. Time-resolved photoluminescence (TRPL) has emerged as a powerful technique to probe carrier lifetimes, non-radiative recombination pathways, and the impact of defect passivation. By analyzing TRPL decay trends, we evaluate the effectiveness of various passivation strategies and investigate electron transport mechanisms. These insights contribute to the development of approaches to minimize recombination losses and improve device stability.

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ANALYTICAL SEMINAR

Unlocking the Microscopic World: Exploring the Power of Photo-induced Force Microscopy

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Photo-induced force microscopy (PiFM) is a sophisticated scanning probe method that produces spectroscopic contrast images with nanometer-scale spatial resolution. PiFM operates by locally polarizing a sample using the enhanced, non-propagating near field at the tip of a pointed probe, which generates a tiny photo-induced force on the cantilevered tip. Despite this force usually being in the piconewton (pN) range or less, it is possible to create detailed photo-induced force maps by detecting changes in the cantilever's oscillation. Since its introduction in 2010, PiFM has evolved into a potent nano-spectroscopic tool, significantly expanding its imaging capabilities and applications. In my presentation, I will explain the PiFM technique to the scientific audience and discuss its application in microbial nanostructures and single molecules.

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