ANALYTICAL SEMINAR

Acoustic Droplet Levitation: A Reaction Vessel for Contactless Analytical Chemistry

Patrick Herchenbach

Graduate Student, Purdue University

Bio: Patrick Herchenbach graduated from Creighton University in May 2023 with a B.S. in chemistry and music. He is now a 2nd year student in the Jeffrey Dick group where he developed a novel method to quantify the interfacial tension of droplets adsorbed to an electrified interface and studies spontaneous oxidation in multiphase systems

Abstract: Recently, there has been great interest in studying reaction acceleration at the gas|liquid interface and contactless manipulation of chemical systems[1,2]. Electrospray and other nebulization techniques have been used to study the behavior of droplets in air[3–5], however these techniques are ensemble methods and often require the collection of sprayed droplets on a solid surface. Acoustic levitation offers a completely contactless reaction vessel for the study of individual droplets. Acoustic levitation is a versatile technique that can be paired with spectroscopy and mass spectrometry to study various systems including volatile reactions, and enzymatic reaction acceleration[6,7].

Tuesday, September 17th, 2024 *3:30 pm* *WTHR 172*

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

ANALYTICAL SEMINAR

CryoEM Method MicroED for Rapid and Reliable Structural Elucidation of Small Molecules

James Nguyen

Graduate Student, Purdue University

Bio: James Nguyen is from Ventura, California. He earned a BS in Chemistry from California Lutheran University, where he focused on synthesizing HSC, a key natural product of Desferrioxamine E. After graduation, he pursued a MS in Chemistry at California State University, Northridge, working on the total synthesis of natural products, including Balmoralmycin and Mayamycin. In the Fall of 2023, James joined Dr. Jeffrey Dick's lab, focusing on the reactivity and dynamical aspects of microdroplets. Additionally, he researches aqueous zinc metal batteries.

Abstract: Structural characterization is crucial for the determination of small molecules. Over the past 50 years, various techniques, such as NMR, FTIR, and mass spectrometry, have been developed for structural analysis. However, NMR has remained the predominant technique for the elucidation of small molecule structures. While NMR and other spectroscopic methods contribute to structural determination, X-ray diffraction is necessary for precise and unambiguous structural conclusions. Unfortunately, X-ray diffraction is not widely used for small molecules due to its limitations such as crystal growing. The crystal growth process is often arduous and time-consuming, making X-ray diffraction an inefficient and lengthy method for structural characterization. Cryo-microscopy (CryoEM) method microcrystal electron diffraction (MicroED) is a recently developed tool that provides rapid and reliable structural analysis. This presentation will explore cryoEM method microED, which enables atomic-resolution analysis from nanocrystals, offering a faster and more efficient approach to small molecule structural characterization.

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ANALYTICAL SEMINAR

From A to Zeta: Leveraging Electrokinetic Phenomena to Measure Zeta Potential

Brison Shira

Graduate Student, Purdue University

Bio: Brison is a second year in Graham Cooks' research group. Before Purdue, Brison read classics and researched prebiotic chemistry with Prof. Jay Forsythe at the College of Charleston. In Prof. Cooks' group he continues working to uncover the chemistry that led to biology. When outside the lab, he enjoys coaching the Purdue Crew team.

Abstract: Zeta potential measurement is a non-destructive technique that probes the stability of a dispersed phase in a dispersion medium. To characterize nanoparticles, colloids, and emulsions, understanding the electrostatic forces at the surface of a particle and its immediate solvent environment determines whether particles will aggregate or remain stably dispersed. This technique is a lynchpin in colloid and interfacial science, enabling engineering for a variety of applications. We will discuss the fundamental aspects of this measurement and the role of zeta potential measurements in wastewater treatment and drug delivery. Though the technique provides only limited insight into the chemical and physical properties of an analyte, the indications it gives as to the stability of a colloid have contributed to its widespread use.

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