JOINT SEMINAR

Texas Center for Superconductivity at the Univ. of Houston
Center for Integrated Bio and Nano Systems
Materials Engineering Program

Yunlong Zhang, Ph.D.

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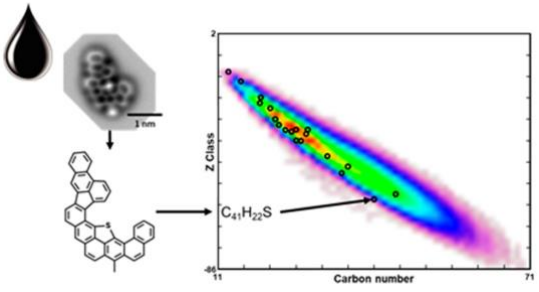
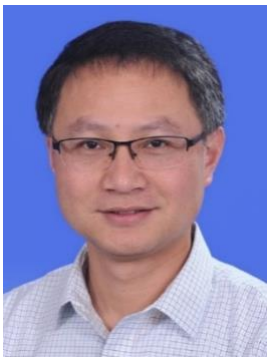
Friday, April 12, 2024
1:00 p.m. – 2:00 p.m.
Face to Face: Houston Science Center (HSC), 102

Unlocking Mysteries of Petroleum Molecules and Their True Value

ABSTRACT: Petroleum, as one of the most complex molecular mixtures on Earth, presents a significant scientific challenge in understanding its molecular composition. While tremendous strides have been made in characterizing petroleum molecules and enabled its refining for fuel products, the shift towards clean and renewable energy necessitates a deeper comprehension of its chemical structure. This understanding opens avenues for utilizing petroleum molecules beyond combustion, including in petrochemicals, polymers, and materials.



This seminar addresses three key questions: (a) Do we already understand the structure of petroleum? (b) What recent advancements have been made? (c) What are the implications? Through a brief literature review, I will show that the single molecular imaging with non-contact AFM offers unparalleled advantages in elucidating structure of individual molecules in petroleum mixtures. Many of these structures are novel, presenting opportunities for innovative applications. I will share some recent research on characterizing the aromatic molecules in petroleum pitches, with insights emerge into their role in the formation of carbon fiber and other carbon materials. These early results hold promise for reducing emissions in steel and concrete industries and for applications such as battery electrode materials, hence contributing to energy transition. (Image credit: Y. Zhang, "Application of Noncontact Atomic Force Microscopy in Petroleum Characterization: Opportunities and Challenges", *Energy Fuels* 2021, 35, 18, 14422)



BIO: Yunlong Zhang received his Ph.D. in Physical Organic Chemistry from The Ohio State University in 2010. After completing a postdoc training at MIT, he joined ExxonMobil in 2014 as a staff scientist in the corporate strategic research Labs in New Jersey, and recently moved to Houston as a project leader and manager. He is passionate about solving practical problems using a fundamental approach. His expertise includes hydrocarbon science, characterizing structures of complex mixtures and understanding structure-property relationships. His research has led to over 60 publications and over 40 external keynote presentations and seminars, in additional to numerous internal reports, seminars and patents. Dr. Zhang is actively engaged in professional societies through volunteering, including organizing the International Conference of PetroPhase 2021. He was appointed as an Associate Editor for ACS journal *Energy&Fuels* in 2022 and is currently served as the Chair of the ACS ENFL division in 2024. He has been recognized by several awards, including the 2021 Rising Star Award by ACS, 2020 R&D Excellence Award in ExxonMobil, and the 2019 Glenn Award by ACS ENFL, and the 2023 IUPCA Young Observer Award by USNC/IUPAC.

Persons who require special accommodations to attend this lecture should call 713-498-9703 as soon as possible.