

“New Opportunities Offered By Lipid-Modified Electrodes to Modulate and Interrogate Transmembrane Diffusion Rates and Mechanisms”

by

Dr. Edmund Tse
The California Institute of Technology

Date: 6 Dec 2016

Time: 10:30am to 12:00pm

Venue: Meeting Room 3 (1B-G04), G/F, Block 1, To Yuen Building

Abstract

Diffusion of small molecules between intra- and extra-cellular spaces across lipid layers is instrumental to the understanding of fundamental biological transport processes and the improvement in drug delivery schemes. In natural systems, organisms develop intricate ion channels and stimuli-responsive gating machineries for signal transduction, cell identification, and toxin removal, while still allowing the selective and proficient uptake of vital nutrients that are critical to survival, growth, and reproduction. Understanding membrane function is a colossal step in developing cutting-edge drug therapies in a rational way. In this presentation, I report on my efforts to interrogate the “flip-flop” diffusion mechanism of alkyl proton carriers traversing the lipid layer of a hybrid bilayer membrane (HBM) using electrochemical techniques. The 4-nm thick HBM electrochemical platform consists of a lipid monolayer appended on top of a self-assembled monolayer (SAM) containing a Cu complex for O₂ reduction reaction (ORR) on a Au electrode. The “flip-flop” diffusion rates of the proton carriers dictate the turnover frequency of the Cu catalyst. We envision that the methodologies developed here will ultimately lead to improved understanding of the mechanism of “flip-flop” diffusion in lipid bilayers and aid in the development of next-generation targeted drug delivery schemes.

About the Speaker

With Dr. Tse’s experience in organometallic synthesis, exposure in catalytic systems, and background in energy-related studies, he is now designing new molecular framework for next generation fuel cells under the supervision of Professor Andrew A. Gewirth and Professor Thomas B. Rauchfuss at the University of Illinois at Urbana-Champaign. He is exceptionally thankful for the gracious support from the Croucher Foundation.

After Dr. Tse finished his secondary school education at the Diocesan Boys' School, he gained his first lab experience at the University of Hong Kong under the guidance of Professor C.-M. Che. He then pursued his bachelor degree at the University of Virginia in the United States. During his time as an undergraduate student, he was fortunate to work for Professor T. Brent Gunnoe on controlled hydroarylation of ethylene using a ruthenium-Ep complex. This project potentially can unlock a new paradigm to prepare precursors to plastics, fuels, and surfactants on an industrial scale. Through the College Science Scholar program at the University of Virginia, he had the opportunity to spend one summer working for the Center for Catalytic Hydrocarbon Functionalization on partial oxidation of methane to methanol using a tungsten-oxo complex as an advanced catalyst technology that facilitates the efficient use of natural gas.

Contact

Miss Janice Leung (3442-4902, janice.leung@cityu.edu.hk)

All are welcome