UNIVERSITY OF RHODE ISLAND

Department of Chemistry

SEMINAR

Room 234 Pastore Hall

3:00 p.m, Monday, March 14, 2016

Prof. Jonathan Rochford

Dept. of Chemistry

Univ. of Massachusetts Boston

Boston, MA

"Engineering of Molecular Systems for Application in CO_2 Conversion and Photoacoustic Imaging "

HOST

Brenton DeBoef

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Engineering of molecular systems for application in CO_2 conversion and photoacoustic imaging

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This seminar will tell the tale of two ongoing research projects in the Rochford research group at UMass Boston. The overarching theme is to explore fundamental mechanisms of energy conversion to benefit society. Firstly, the design of organometallic catalysts for electrocatalytic conversion of CO_2 into clean fuels and valuable chemical feedstocks will be discussed. Our current understanding of catalytic CO_2 reduction with molecular transition metal electrocatalysts has progressed significantly in recent years. However, there remain many unanswered questions and critical challenges ahead. For example, acquiring an advanced understanding of proton-coupled electron transfer (PCET) in the CO_2 reduction catalytic cycle will allow us to manipulate reactive intermediates under non-equilibrium conditions to promote a desired outcome. Motivated by our desire to expand upon the structural design and predictable properties of conventional polypyridyl complexes, the electrocatalytic properties of Mn(I) tricarbonyl catalysts incorporating pendant base functionalities in their second coordination sphere will be presented and their efficiencies for proton coupled reduction of CO_2 to CO and HCO_2H discussed. More recently, we have also begun to investigate the properties of organic dyes that efficiently convert light energy to sound energy for application as molecular photoacoustic contrast agents (MPACs). Photoacoustic imaging is an emerging imaging modality that combines the deep tissue penetration of ultrasound with the high contrast of optical imaging. Through the utilization of MPACs inspired by the naturally occurring curcumin chromophore, a photophysical mechanism for nonlinear photoacoustic amplification will be discussed.