Two derivatives of iron tetraphenylporphyrin bearing prepositioned phenolic functionalities on two of the opposed phenyl groups, prove to be remarkable catalysts of the reduction of CO2 to CO when generated electrochemical at the Fe(0) oxidation state (see one example on Scheme 1), in terms of selectivity (the CO faradaic yield is nearly quantitative), durability, overpotential and turnover frequency. They are taken as examples of the possible role of pending acid-base groups in molecular catalysis. Comparative cyclic voltammetry of these two molecules as a function of the scan rate and of the concentrations of CO2 and added phenol has made it possible to unravel the reaction mechanism in spite of the adverse side-phenomena. Quantum calculation further confirm the mechanism. Finally, comparison (benchmarking) with other catalysts through catalytic Tafel plots will be discussed.

References

Date: 23rd July 2014 (Wednesday)
Time: 11:00am – 12:30pm
Venue: NTU SPMS CBC Building Level 2, Conference Room
Host: Assoc Professor Richard Webster