



MSc Departmental Seminar

Bahareh Bastan

Department of Chemistry | Supervisor: Dr. Talia Jane Stockmann

Thursday, September 26, 2024 at 1:00 p.m. (Room: CSF-1302)

Title: Electrochemical investigation of Fe^{2+} :trioctylphosphine oxide coordination reaction at a micro liquid | liquid interface

Abstract:

Dissolved Fe is an important micronutrient for marine biota in the world's oceans that typically exists at sub-nanomolar concentrations. Many microorganisms such as phytoplankton have evolved specialized ligands for Fe uptake. Thus, spatiotemporal oceanic mapping dissolved Fe and understanding Fe-ligand binding are critical areas of research. Herein, we have employed the micro (25 μm in diameter) interface between two electrolyte solutions (ITIES) as a platform to investigate Fe^{2+} coordination with trioctylphosphine oxide (TOPO) via an electrochemically controlled facilitated ion transfer reaction. Based on established thermodynamics and using differential pulse voltammetry, the metal ion:ligand stoichiometry (n) and overall binding coefficient (β) of Fe^{2+} -TOPO was determined to be ~ 15 and 4.4×10^{45} , respectively. It is speculated that the high stoichiometry may be owing to the generation pseudo-micelle since n greatly exceeds the typical Fe-ligand stoichiometry. Na^+ and K^+ binding towards TOPO were also examined since they are major electrolyte components in seawater. However, they demonstrated high binding affinities through much lower Na^+ :TOPO or K^+ :TOPO stoichiometries of roughly 1.18 and 2.52 as well as β 's of 3.3×10^{14} and 2.4×10^{15} , respectively.