## Project title: Redox probes to characterize environmental processes

### Project Description

This project will be focused on selecting and testing suitable redox-active compounds as probes for characterizing redox processes in natural sediments and groundwater aquifers. Redox processes play central roles in regulating biogeochemical cycles of nutrients and trace elements, and chemical and biological transformation of environmental contaminants. The current understanding of redox conditions in natural environments primarily relies on conventional measurements of environmental parameters and species, including oxidation-reduction potential (ORP), dissolved oxygen, dissolved Fe(II), and etc., which not only lack the generality to represent certain redox conditions given the usual redox disequilibrium in natural environments, but also fail to directly link to the specific processes that are of interests (e.g., contaminant degradation). On the other hand, the transformation processes of probe compounds sometimes are directly determined by the overall redox conditions. In other cases, probe compounds have similar properties to target contaminants, and can be used as surrogates to examine specific processes. Investigating the suitability of redox probes at laboratory scale in this project could lead to their potential implementations at larger scales to improve the understanding of redox process in natural environments, which will be beneficial to both fundamental research on biogeochemistry and applied practices on contaminant remediation.

### Project duty

The primary activity of this position will be performing batch kinetic experiments under a range of redox and solution chemistry conditions, with both probes and contaminants. Several promising probe compounds are expected to be tested. The initial experiments will be conducted under the instruction of mentors, but afterwards, the intern is expected to carry out the entire experiments independently by following established standard protocols. Such work may include material and solution preparation, data collection, data compilation and preliminary data analysis. The position will offer extensive hands-on experiences on handling natural and synthetic materials in strictly controlled environment, routinely operating a variety of instruments, and learning basic and advanced data anylsis skills. The outcome of this project is expected to be published in peer-reviewed journals with high impact.