The ‘proton-coupled electron transfer (PCET) processes’ which are among the most important phenomena that serve to control a variety of chemical and biological transformations. While extensively studied in a variety of natural systems and a number of discrete metal complexes, PCET mechanisms are less well codified in the case of purely organic compounds. We found that a planar, 24 π-electron antiaromatic naphthorosarin displays unique redox reactivity upon protonation. Specifically, treatment with acid (i.e., H2) yields a 26 π-electron aromatic tripiciratoic mono-cationic species; it is produced spontaneously via an intermediate, but stable, 25 π-electron nonaromatic tripiciratoic mono-radical dication.

The second topic is the development of molecular receptors possessing high affinity and selectivity for various anionic guests utilizing various molecular scaffolds. The calix[4]pyrrole have shown to bind anions in organic polar media and the encapsulation of the binding domain of the calix[4]pyrrole greatly enhances the binding affinity. We have designed and synthesized various calix[4]pyrrole-based ion/molecular receptors. The guest binding studies indicated that the synthesized systems have shown many interesting properties. Also, picket calix[4]pyrrole have been synthesized and studied for selective recognition of anions through fluorescent dye displacement assay (FDDA).

References