Selected Publications


Our research interests focus on one of the major biomacromolecules, nucleic acids and their biological/medical applications. Currently, we explore the contributions of oxidative damage and electronic properties of nucleic acids to their folding structures, biological functions, and medicinal applications at the interface of chemistry, biology, nanotechnology and bioimaging.

REDOX CHEMISTRY OF NUCLEIC ACIDS
-OXIDATION OF GUANINE QUADRUPLEXES (GQ)

The site specificity of guanine oxidation in G-quadruplexes and their ability to mediate charge transport will be explored at our lab with variety of chemical and biological methods, in order to elucidate the correlations between oxidative vulnerability of G-quadruplexes and their biological functions as regulatory factors to replication/transcriptions.

-CHARGE TRANSPORT (CT) IN NON-B FORM NUCLEIC ACIDS.

DNA mediated charge transport is one of the pivotal consequences of redox reaction in nucleic acids. Oxidative CT contributes to cellular signaling processes to oxidative stress, while reductive CT has promising applications to DNA based biosensor and electronic nanodevices. Nonetheless, oxidations of non B-form nucleic acids and the sequential CT processes have been rarely explored. We investigate the charge transport events in several families of non B-form duplexes, including A-form, Z-form duplexes, triplexes and tetrplexes. Most of the structures are recently identified as transient intermediates from many biological processes and may have promising therapeutic applications.

- REDOX CHEMISTRY ON EPIGENETICS

5-Hydroxymethylcytosine (hmC) is recently discovered as a critical redox intermediate of cellular de novo demethylation process and may interfere many important biological/pathogenic processes. We explore the preparation, detection, redox chemical, physical, and biochemical properties of this new epigenetic nuclease in order to elucidate its biological functions.

DNA BINDING MOLECULES FOR THERAPEUTICS - GQ-PT(II)

A series of cyclometalated Pt(II) compounds derived from the well-known anticancer drug, cis-platin. The extended aromatic area and positive charges secure good affinity and selectivity of the compounds to quadruplex DNA over duplex DNA. Incorporating alkyl or ethylene glycol tail on one or both ligands induce further selectivity over topological GQ structures, which provides potential selective targeting on different oncogenes. Fluorescent Pt(II) complex can apply to in vitro and in vivo bioimaging of quadruplex nucleic acids.