From Simple Discrete Metal Complexes to Ensembles, Conjugates and Nano-Assemblies for Sensing, Molecular Imaging and Bioassays

Vivian W.W. Yam

Institute of Molecular Functional Materials (UGC Areas of Excellence Scheme) and
Department of Chemistry, The University of Hong Kong, Pokfulam Road, Hong Kong, PR China

In this presentation, various new classes of chromophoric and luminescent metal complexes will be described. A number of these metal complexes have been shown to display rich optical and luminescence behavior. Correlations of the chromophoric and luminescence behavior with the electronic and structural effects of the metal complexes have been made to elucidate their spectroscopic origins. These simple discrete metal complexes are found to undergo supramolecular assembly to give a variety of nanostructures and morphologies. Subtle changes in the microenvironment and nanostructured morphologies have led to drastic changes in both the electronic absorption and emission properties of these supramolecular assemblies. Explorations into the underlying factors that determine their spectroscopic properties and morphologies as well as their assembly mechanisms have provided new insights into the understanding of the interplay of the various intermolecular forces and interactions for the directed assembly of novel classes of metal-containing soft materials and hybrids. Through a fine control of the interplay amongst various coordination motifs, electrostatic assembly and non-covalent metallophilic, hydrophobic-hydrophobic and π-π interactions, together with the modulation of various photo-induced electron and energy transfer processes, new strategies towards the rational design of luminescent metal-ligand chromophoric ensembles, conjugates and nano-assemblies that would lead to changes in the absorption and emission characteristics for potential applications and functions in luminescence sensing, molecular imaging and bioassays, have also been made.