CONTROL OF EXCITED STATES, NANOSTRUCTURES AND FUNCTIONS THROUGH MOLECULAR DESIGN AND SUPRAMOLECULAR ASSEMBLY

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Works in our laboratory have shown that novel classes of light-absorbing and luminescent metal-containing molecular materials could be assembled through the use of various metal-ligand chromophoric motifs. In this presentation, various design and synthetic strategies for new classes of chromophoric and luminescent metal complexes will be described. A systematic study of the electronic spectroscopy of the newly synthesized metal complex systems has provided fundamental understanding on the spectroscopic and luminescence origin as well as the structure-property relationship of these complexes. Some of these simple discrete metal complexes are found to undergo supramolecular self-assembly or co-assembly with polymers to give a variety of nanostructures and morphologies with different colors and emission properties. Subtle changes in the microenvironment, conformations and nanostructured morphologies have led to drastic changes in both their electronic absorption and emission properties. Through a fine control of the interplay amongst various coordination motifs, electrostatic assembly, and non-covalent metal–metal, π–π, hydrogen bonding and hydrophobic interactions, new strategies toward the rational design of luminescent metal-ligand chromophoric ensembles and assemblies that would lead to changes in the absorption and emission characteristics and potential applications and functions in luminescence sensing, bioassays and molecular imaging, have been made.