

Excited State Processes in Radical Elaborated Cyclometalated Platinum Complexes

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Understanding of the lowest triplet excited state of organo-transition metal complexes is useful for wide range of applications such as emitting materials in Organic Light Emitting Diodes(OLEDs), Light Emitting Electrochemical Cells (LEECs), chemosensors, photosensitizers etc. However, improvement of ligand design strategies for preparing highly luminescent and color tunable organo-transition metal complexes with desired triplet excited state lifetimes is still a challenge. Here, we aim to explore the influence of radical substituents on electronic structure, luminescence quantum efficiencies, and excited state lifetimes by synthesizing new radical elaborated molecular frameworks built on known cyclometalated square planar platinum(II) complexes. We are studying their excited state processes using numerous spectroscopic methods that include EPR, MCD, photoluminescence, and transient absorption spectroscopies. These spectroscopies probe both ground and excited state electronic structure and are used to calibrate the results of both bonding and spectroscopic calculations. Our present study focuses on investigating the effects of localized pendent radicals on the photophysical properties of the chromophore, specifically with respect to how the spin-doublet radical substituent may facilitate radical enhanced intersystem crossing (radical enhanced ISC) through new exchange interactions within multiple spin centers. Furthermore, this study of multi-spin excited state dynamics of radical elaborated molecular frameworks will allow direct control of dynamic electron spin polarization through exchange manipulation of the photoexcited triplet state of the chromophore.