Photophysical properties of *fac*-[Re(PPh$_3$)(CO)$_3$(NN)]$^+$ complexes

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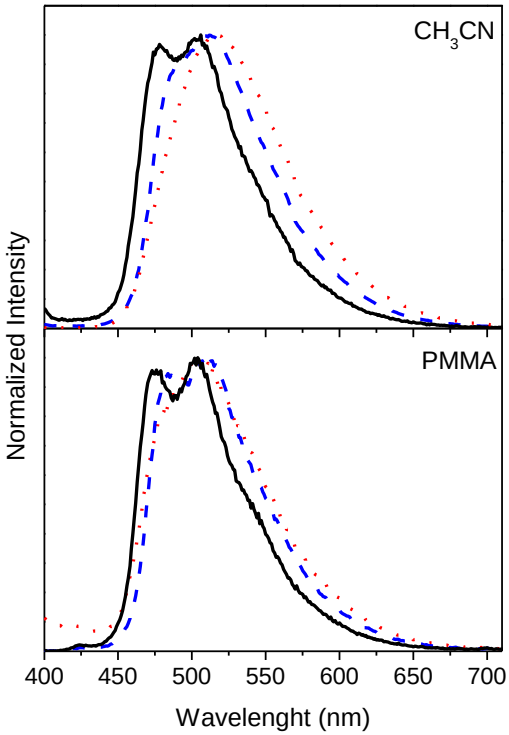
Rhenium(I) polypyridyl complexes exhibit very interesting photophysical and photochemical properties which can be exploited in the development of organic light emitting diodes (OLEDs). In this work, the *fac*-[Re(PPh$_3$)(CO)$_3$(NN)]$^+$ complexes, PPh$_3$ = triphenylphosphine and NN = 1,10-phenanthroline (phen), 4,7-dimethyl-1,10-phenanthroline (Me$_2$phen), 4,7-dimethoxy-1,10-phenanthroline ((MeO)$_2$phen) were synthesized, and characterized by ^{1}H NMR, UV-vis and IR spectroscopies. Photophysical properties using steady state and time-resolved emission spectroscopies were investigated in fluid and rigid media. The electronic absorption spectra exhibit two main absorption bands: the higher energy band, which was assigned to IL$_{NN}$, and the lower energy band, assigned to MLCT$_{Re\rightarrow NN}$. All three complexes showed emission at room temperature in CH$_3$CN solution, which is very sensitive to the NN ligand. For *fac*-[Re(PPh$_3$)(CO)$_3$(phen)]$^+$ in CH$_3$CN is observed a broad and structureless ^{3}MLCT emission band, however a more structured emission was observed for the substituted phen complexes. This behavior is due to the introduction of electron-donating groups at 4 and 7 positions on the phen ligand which promotes the destabilization of the ^{3}MLCT state along with the stabilization of the ligand-centered excited state, ^{3}IL. When embedded into a PMMA matrix, the intraligand character of the emission became more evident. Therefore, this results provides new insights on the photophysical properties of new Re(I) complexes and can be used in the development of molecular devices.



Emission spectra of *fac*-[Re(PPh$_3$)(CO)$_3$(NN)]$^+$ complexes, NN = phen (...), Me$_2$phen (---) and (MeO)$_2$phen (–).

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