Strong Fluorescence Enhancement Of Cyclometalated Ir(III) Complexes In Cucurbit[10]uril

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Fluorescent cyclometalated iridium(III) complexes are attracting widespread interest due to their unique photophysical properties and promising fluorescence applications, especially as labeling reagents for biomolecules[1].The fluorescence properties of these Ir(III) complexes are very sensitive to their local environment[2]. With respect to this point, we have examined the fluorescence sensitivity of some Ir(III) polypyridine complexes by encapsulation within the large macrocycle cucurbit[10]uril (Q[10]). In this work we present for the first time the full encapsulation of Ir(III) polypyridine complexes in Q[10], which resulted in a blue shift (from 595 nm to 543 nm) and strong fluorescence enhancement by a factor of ~40 (in 1:1 molar ratio of host:guest), and this increased to a maximum of around 80-fold in the presence of excess Q[10] (>10 x excess)and a blue shift of 34 nm. Binding constants were determined and the effect of temperature was investigated. Preliminary electrochemical and lifetime measurements were also carried out to complement the fluorescence work. We propose to take advantage of this fluorescence enhancement to improve fingerprint detection in terms of visualization.
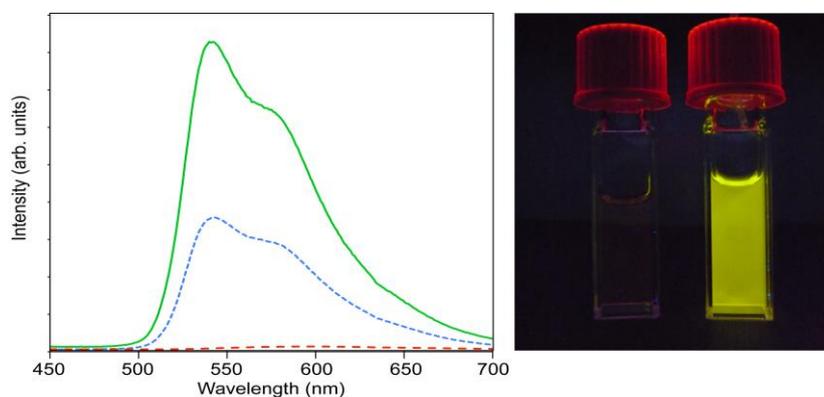

Figure 1.0: *Left panel: Emission spectra in aqueous buffer solution (pH 4.7) at 22 °C: Free IrCHO (red dashed); with added Q[10] in 1:1 molar ratio (blue dotted); and in the presence of excess of Q[10] (green). IrCHO concentration = 10^{-5} mol/L. Right panel: Solutions of free IrCHO (left) and Q[10]-encapsulated IrCHO (right), [IrCHO] = 4 x 10^{-5} M in both.*

References
1) Kyle, R., et al. *Inorg. Chem.*, **2012**, 51, 5082-5094.
2) Lo, K.K.W., et al. *Inorg. Chem.*, **2003**, 47, 6886-6897.