Multiphoton and Upconversion Processes in Transition Metal and f-Element Containing Systems for Optical imaging and Biosensing Applications

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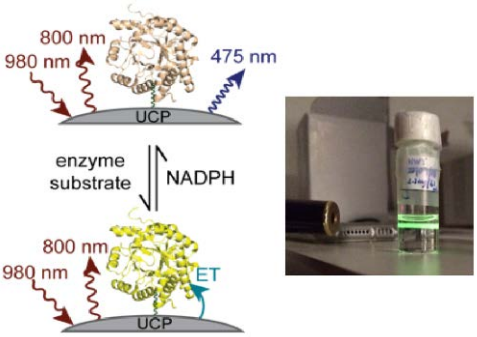
Materials that undergo multiphoton excitation, including two photon absorption and upconversion, are finding increasing use in many applications including 3D fluorescence microscopy, data storage, optical power limiting, biological imaging and as optical sensors.[1] In organic and transition metal based systems, large two photon cross sections can arise from centrosymmetric charge transfer in push-pull electron donor-acceptor (D-A) diads, whereas in the case of the f-elements (lanthanides and actinides), both two photon absorption and upconversion processes are feasible. However, direct multiphoton excitation of lanthanides and actinides in solution remains relatively unexplored to date. Here, will we describe our recent work in this area with a view to harnessing and exploiting the multiphoton optical properties of metal-based compounds. We will present the multiphoton emission properties of a family of d^6 transition metal complexes bearing one or two polar terpyridyl-stilbene derived chromophores[2] that have been optimised for multiphoton applications, discuss how lanthanide doped upconverting nanoparticles can be tailored to sense enzyme turnover and present the first examples of f-element two photon absorption in solution.[3] Our results indicate that these systems are suitable candidate molecules for multi-photon applications and these will be discussed further.[4]



References

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