Luminescent Lanthanide Complexes for Sensing of Nitroaromatic Explosives

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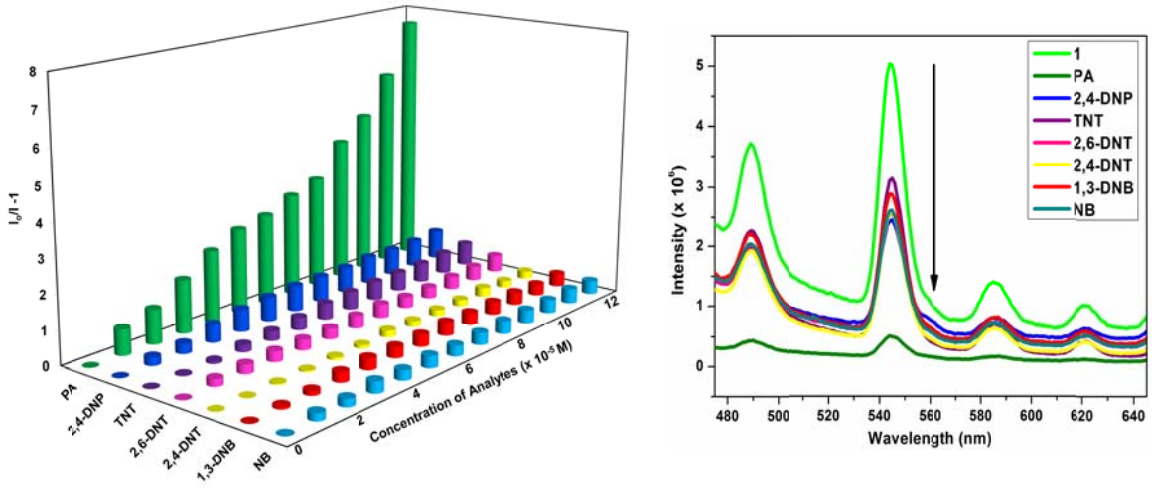
Abstract:
Over the past decades, Lanthanide coordination compounds have been of intense interest for their practical applications in sensing, radioactive labelling, time resolved fluoroimmunoassays, bio-imaging, etc.[1] Modulation of their characteristic luminescence is the key to these applications. One of the ways to sensitize the luminescence of Lanthanide centres is through the coordination of N/O donor ligands acting as chromophores (an "antenna effect").[2] In this work, a new pyridine-carboxylate based ligand, such as potassium 2,2'-(butane-1,4-diylbis((pyridin-2-ylmethyl)azanediyl))diacetate (K_2bpbd) - prepared in high yield and spectroscopically characterized - has been utilized to make three new lanthanide complexes namely, $[Ln(bpbd)(H_2O)_2(NO_3)]\cdot 6H_2O$, where Ln = Tb (**1**), Sm (**2**) and Dy (**3**). These complexes have been extensively characterized by various spectroscopic techniques (UV-vis and FTIR spectroscopy), elemental analyses, thermogravimetric analysis, FESEM and powder X-ray diffractometry. These show very intense characteristic luminescence features that confirm the antenna effect of the ligand on the metal centre. Based on this property, these luminescent complexes have been examined for their potential for sensing of various nitroaromatic explosives through luminescence quenching experiments.[3] Among these three complexes, compound **1** is found to be the best for selective sensing of picric acid (PA), one of the most notorious explosives, in water with a detection limit of 1 ppm.



a) b)

Figure. Selective sensing of PA by compound **1**: a) Stern-Volmer plot, b) Fluorescence quenching with different analytes.

References:

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