

Abstract

In the last few decades, Lanthanide coordination compounds have been of intense interest for their practical applications in sensing, radioactive labelling, time resolved fluoroimmunoassays, bio-imaging, etc. Modulation of their characteristic luminescence is the key to these applications. Lanthanide ions are sensitized via an “antenna effect” through the coordination of N/O donor ligands acting as chromophores to obtain highly intense luminescence from the Lanthanide centre, which normally show Laporte forbidden f-f transitions with low intensity emission bands. In this work, a pyridine-carboxylate based ligand such as potassium 2,2'-(butane-1,4-diylbis((pyridin-2-ylmethyl)azanediyl))diacetate (K2bpbd), which is prepared in high yield and spectroscopically characterized, has been utilized to make nine new lanthanide complexes namely, $\{[\text{Ln}(\text{bpbd})(\text{H}_2\text{O})_2(\text{X})]_n \cdot y(\text{H}_2\text{O})\}$, where Ln = La (1, 6 and 7), Nd (2, 8 and 9), Sm (3), Tb (4) and Dy (5); X- = NO₃⁻ (1, 2, 3, 4 and 5), OAc⁻ (6 and 8), Cl⁻ (7) and ClO₄⁻ (9); y = 7 for 1, 2, 3 and 8 and = 5 for 4-7. All these Ln-MOFs were extensively characterized by various spectroscopic techniques (UV-vis and FTIR), elemental analyses, thermogravimetric analysis and powder X-ray diffractometry. All but La complexes show very intense characteristic luminescence features that confirm the antenna effect of the ligand on the metal centre. Complexes 2, 4, 8 and 9 display selective sensing of trinitrophenol (TNP) in water with the best detection limit of 1 ppm for 4.