Electronic Supplementary Material (ESI) for New Journal of Chemistry. This journal is © The Royal Society of Chemistry and the Centre National de la Recherche Scientifique 2020

## Supplementary Material (ESI) for New Journal of Chemistry

## Luminescent sensing, DFT, extraction and monitoring of Cr<sup>3+</sup> and Al<sup>3+</sup> via

## the application of first derivative fluorescence spectroscopy

Soma Mukherjee <sup>a</sup>\*, Soumi Betal <sup>a</sup>, Asoke Prasun Chattopadhyay <sup>b</sup>

<sup>a</sup> Department of Environmental Science, University of Kalyani
<sup>b</sup> Department of Chemistry, University of Kalyani
Kalyani, Nadia – 741235, West Bengal, India
*Email: somam580@gmail.com* Fax: 033-25828282; Phone: 033-25828750 Ext. 291, 292

## Contents

- 1. <sup>1</sup>H NMR spectra of L in DMSO- $d_6$ .
- 2.  $^{13}$ C NMR spectra of L in DMSO-d<sub>6</sub>.
- 3. IR spectra of L.
- 4. Mass Spectra of L.
- 5. IR spectra of L-Cr<sup>3+</sup>.
- 6. Mass Spectra of L- $Cr^{3+}$ .
- 7. IR spectra of L-Al<sup>3+</sup>.
- 8. Mass Spectra of L-Al<sup>3+</sup>.
- 9. Job's plot of (a) L-Al<sup>3+</sup> (b) L-Cr<sup>3+</sup>.
- 10. Effect of emission L upon addition of water (0.0-50.0% in DMSO).
- 11. Solvent effects (DCM, DMSO, CH3OH, DMSO/H2O (1:1)) of L.
- 12. Fluorescence titration ( $\lambda_{ex}$ , 340.0 nm) of L (1.0×10<sup>-7</sup> M) upon addition of various amounts of (**a**) Fe<sup>3+</sup> ions (0.5 equiv.) in DMSO.
- 13. FTIR spectra of (a) L, (b) L-Al<sup>3+</sup>, (c) L-Cr<sup>3+</sup>.
- 14. Optimized structure of L.
- 15. Frontier molecular orbitals of L.
- 16. Optimised structure of (a) L-Al<sup>3+</sup> and (b) L-Cr<sup>3+</sup>.
- 17. Frontier molecular orbitals of L-Al<sup>3+</sup>.
- 18. Frontier molecular orbitals of L-Cr<sup>3+</sup>.
- 19. pH effects on absorbance values of (a) L-Al<sup>3+</sup> and (b) L-Cr<sup>3+</sup>.

Fig. S1 <sup>1</sup>H NMR spectra of L in DMSO- $d_6$ .



Fig. S2 <sup>13</sup>C NMR spectra of L in DMSO- $d_6$ .



Fig. S3 IR spectra of L.



Fig. S4 Mass Spectra of L.







Fig. S6 Mass Spectra of L-Cr<sup>3+</sup>.







Fig. S8 Mass Spectra of L-Al<sup>3+</sup>.





**Fig. S9** Job's plot of (a) L-Al<sup>3+</sup> (b) L-Cr<sup>3+</sup>.



Fig. S10 Effect of emission L upon addition of water (0.0-50.0% in DMSO).



Fig. S11 Solvent effects (DCM, DMSO, CH<sub>3</sub>OH, DMSO/H<sub>2</sub>O (1:1)) of L.



**Fig. S12** Fluorescence titration ( $\lambda_{ex}$ , 340.0 nm) of L (1.0×10<sup>-7</sup> M) upon addition of various amounts of (**a**) Fe<sup>3+</sup> ions (0.5 equiv.) in DMSO.



Fig. S13 FTIR spectra of (a) L, (b) L-Al<sup>3+</sup>, (c) L-Cr<sup>3+</sup>.



Fig. S14 Optimized structure of L.



Fig. S15 Frontier molecular orbitals of L.



Fig. S16 Optimised structure of (a) L-Al<sup>3+</sup> and (b) L-Cr<sup>3+</sup>.



Fig. S17 Frontier molecular orbitals of L-Al<sup>3+</sup>.



Fig. S18 Frontier molecular orbitals of L-Cr<sup>3+</sup>.



Fig. S19 pH effects on absorbance values of (a) L-Al<sup>3+</sup> and (b) L-Cr<sup>3+</sup>.