Supplementary Information

A highly sensitive and selective fluorescent sensor for Al\(^{3+}\) ions based on thiophene 2-carboxylic acid hydrazide Schiff base

Karishma Tiwari, Monika Mishra and Vinod P. Singh*

Department of Chemistry, Faculty of Science, Banaras Hindu University, Varanasi, Uttar Pradesh 221005, India

**Figure 1**: IR spectra of THN.
Figure 2: $^1$H NMR spectra of THN in DMSO-d$_6$. 
Figure 3: $^{13}$C NMR spectra of THN in DMSO-d$_6$. 
Figure 4: Mass spectra of THN.
**Figure 5:** Effect of addition of various metal ions (1 equivalent) on the UV-visible spectra of 20 µM EtOH–H₂O (1: 4 v/v) solution of THN.
**Figure 6:** Colorimetric change in receptor THN upon addition of 2 equivalents of Al$^{3+}$ in EtOH–H$_2$O (1: 4 v/v) solution.
Figure 7: Bensei-Hildebrand plot for THN with Al$^{3+}$, considering the 1:1 complexation. The goodness of the fit is shown by the $R^2$ value.

\[
\frac{I_0}{I - I_0} = \left( \frac{a}{b - a} \right) \left( \frac{1}{K_B \text{[substrate]}} + 1 \right)
\]

\[
Y = 2.958 \times 10^{-8} X + 0.2089
\]

$R^2 = 0.9958$, $K_B = 7.062 \times 10^6$ M$^{-1}$
**Figure 8:** Fluorescence intensity at 476 nm for THN (0.5 µM) in EtOH–H₂O (1: 4 v/v) solution as a function of the concentration of Al³⁺. The excitation wavelength for the complex was 407 nm ($R^2 = 0.9703$, linear range $= 9.9 \times 10^{-9}–1.98 \times 10^{-7}$).
Figure 9: IR spectra of THN-Al\textsuperscript{3+} complex.
Figure 10: Mass spectra of THN-Al$^{3+}$ complex.