Supplementary Information (SI) for Journal of Materials Chemistry B.
This journal is © The Royal Society of Chemistry 2025

Carbazole-Naphthoyl Hydrazone Conjugate and Its Zn(II)-Complex as Stimuli-Responsive Smart Materials: VOC and Cu^{2+} Detection, AIE insights and Bioimaging Applications

Himani Sharma[a], Akansha Yadav[b], Akhilendra K. Maurya[b] and Rampal Pandey*[, a, c]

[a]Department of Chemistry, National Institute of Technology, Uttarakhand, Srinagar-246174, Uttarakhand, India

[b]Department of Zoology, Institute of Science, Banaras Hindu University, Varanasi- 221005, Uttar Pradesh, India

[c]Department of Chemistry, Maulana Azad National Institute of Technology, Bhopal-462007 (M.P.), India

Email: [a]rppandeysu@gmail.com

Contents:	
Figure S1a	FT-IR of **HL**
Figure S1b	FT-IR of **1**
Figure S2a	^{1}H-NMR spectrum of **HL**
Figure S2b	^{13}C-NMR spectrum of **HL**
Figure S3a	^{1}H-NMR spectrum of **1**
Figure S3b	^{13}C-NMR spectrum of **1**
Figure S4	(a) Composition table showing constituent peaks of C, O, and N in **HL**, (b) C, O, N, and Zn in **1**.
Figure S5	Elemental mapping of (a) **HL**-pristine, (b)1-pristine.
Figure S6.	(a) UV-vis spectrum of **HL** (10 μM) in THF, (b) Fluorescence emission spectra of **HL** (10 μM) in THF/H_2O mixtures (0-99% water fraction)
Figure S7	Size distribution from NTA measurements with particles/ml vs particle size (d, nm) plot.
Figure S8	Fluorescence emission spectra of **HL** (10 μM) in DMSO/H_2O mixtures (0-99% water fraction)
Figure S9	(a) UV-vis spectra of **HL** (10 μM) with various cations in DMSO/H_2O (3:7; v/v) and, (b) UV-vis titration plot of **HL** (10μM) with Cu^{2+} in DMSO/H_2O (3:7; v/v).
Figure S10	(a) UV-vis spectra of **HL** (10 μM) with various anions in DMSO/H_2O (3:7; v/v), and (b) UV-vis spectra of **1** (10 μM) with various anions in DMSO/H_2O (3:7; v/v).

Figure S11	(a) Fluorescence spectra of **HL** (10 μM) with various anions in DMSO/H_2O (3:7; v/v), and (b) Fluorescence spectra of **1** (10 μM) with various anions in DMSO/H_2O (3:7; v/v).
Figure S12	Benesi-Hildebrand plot for binding of **1** with Cu^{2+}
Figure S13	Stern-Volmer plot for fluorescence quenching of **1** in the presence of Cu^{2+}
Figure S14	The sensitivity and linearity plots to determine the LOD for binding/interaction of Cu^{2+} with **1** employing fluorescence technique
Figure S15	Confocal microscopy images for **HL** and **1** at different filters

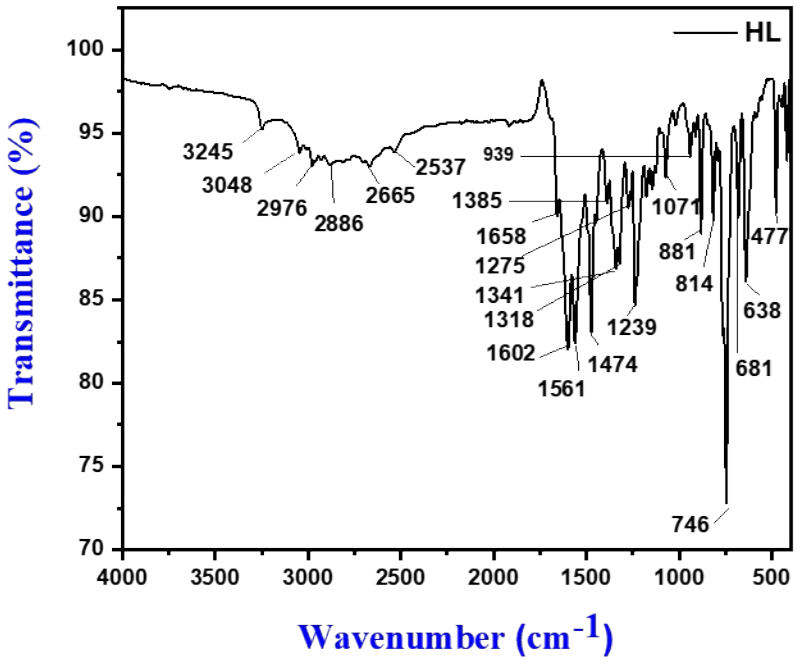


Figure S1a. FT-IR of (a) **HL**.

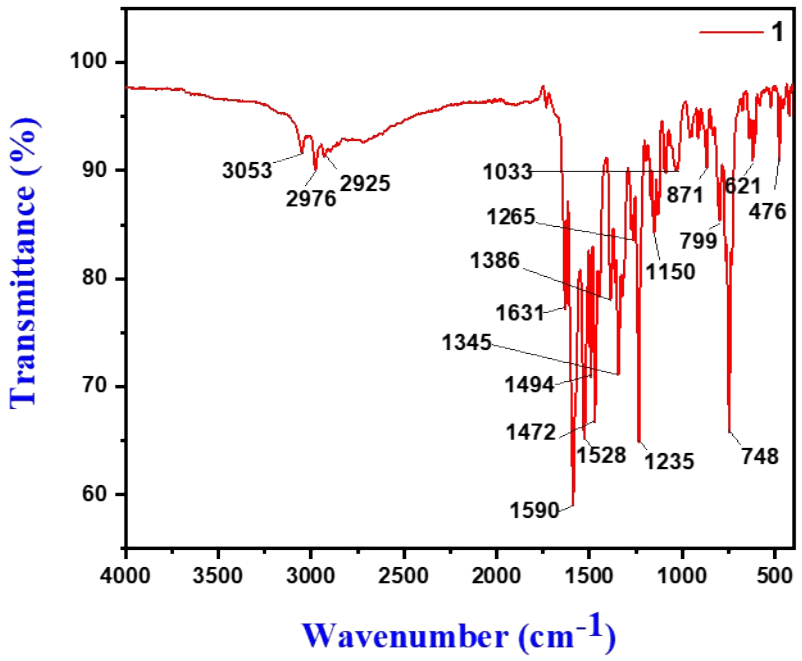


Figure S1b. FT-IR of **1**.

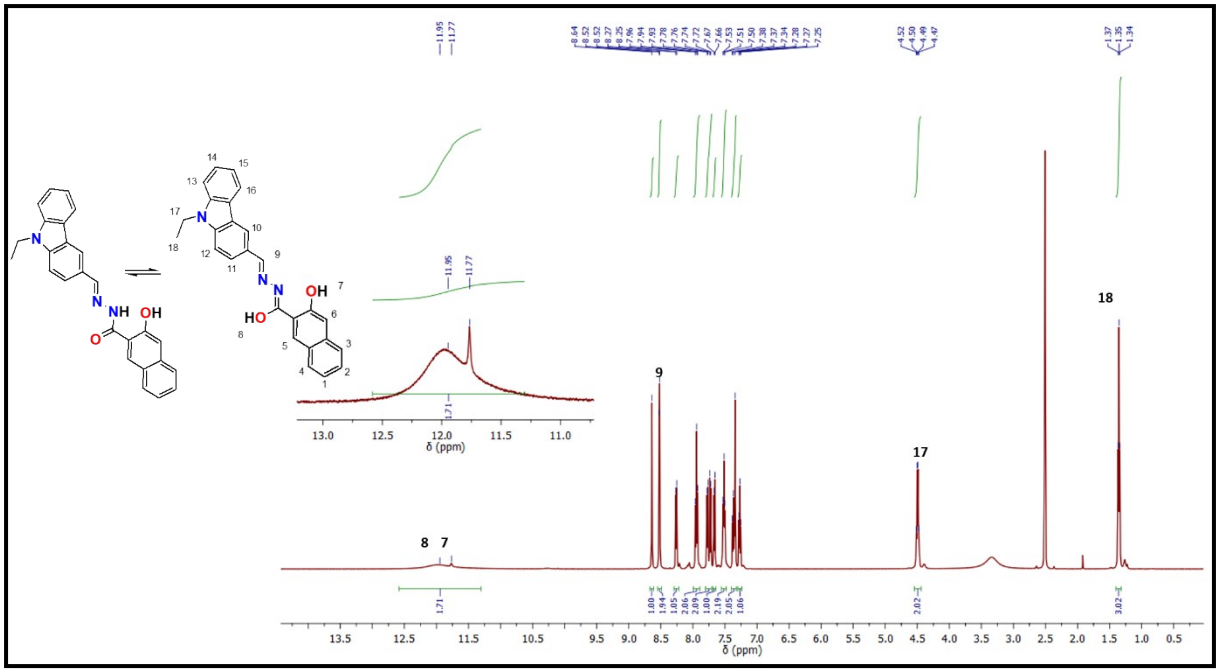


Figure S2a. ^{1}H-NMR of **HL**.

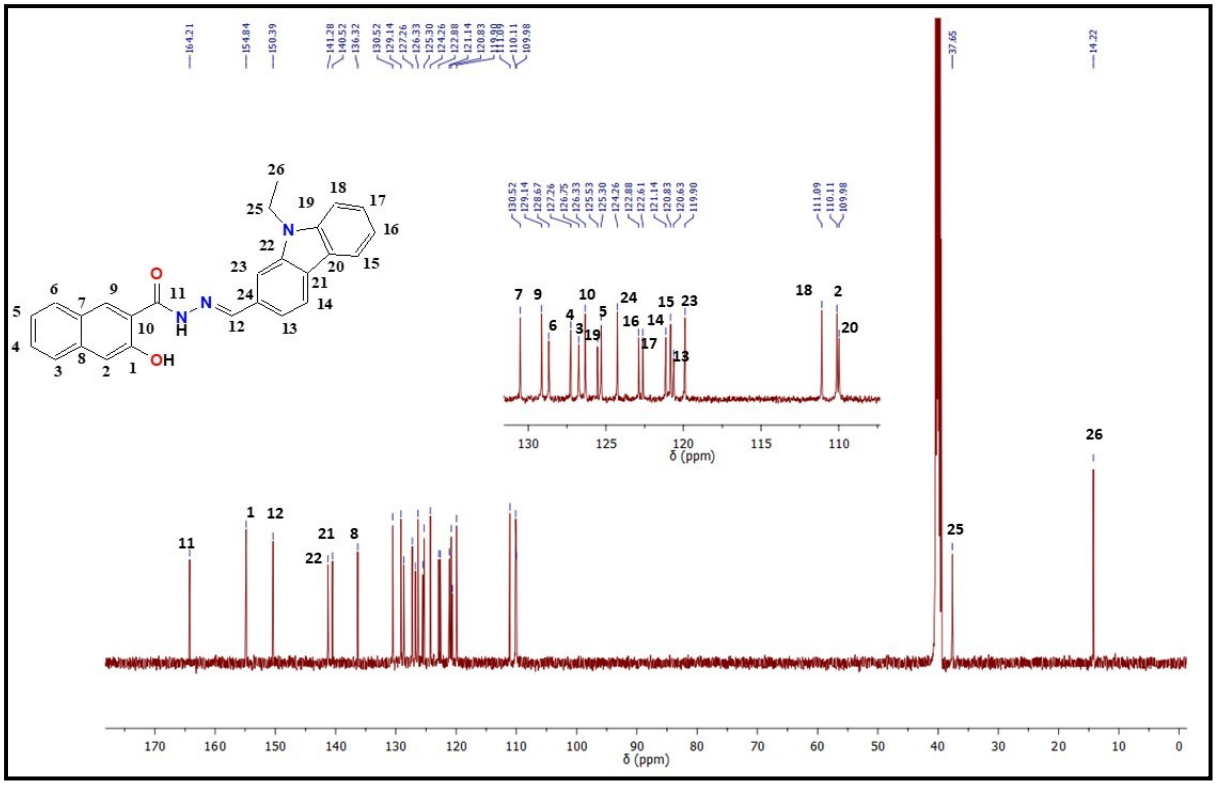


Figure S2b. ^{13}C-NMR of **HL**.

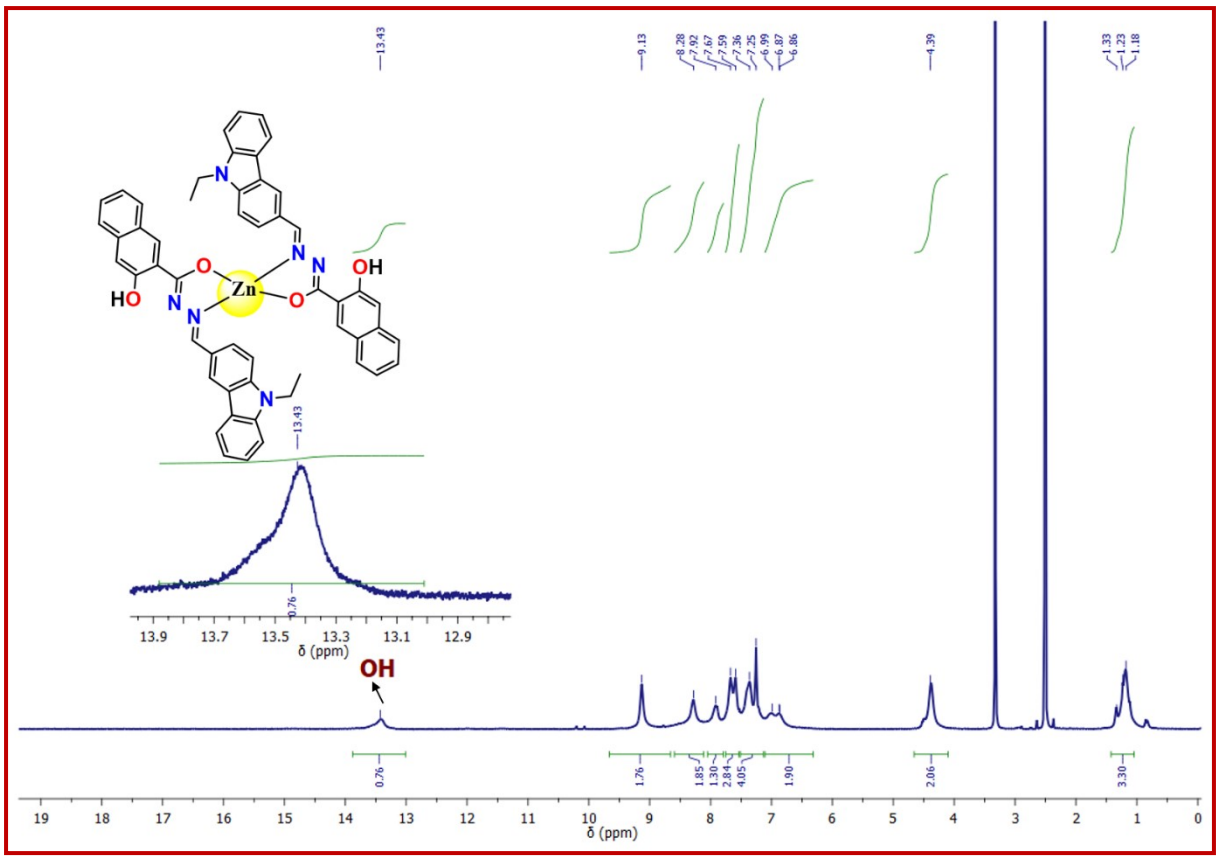


Figure S3a. ^{1}H-NMR of **1**.

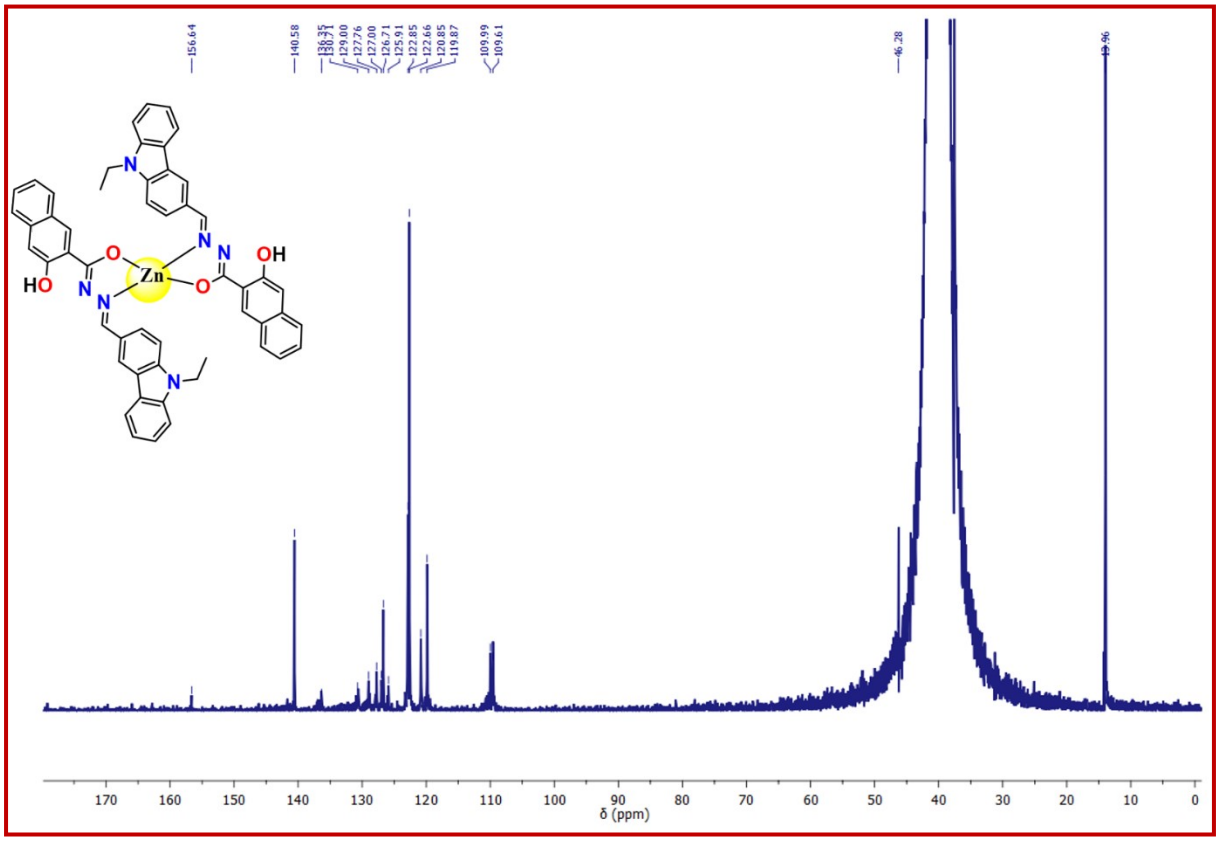
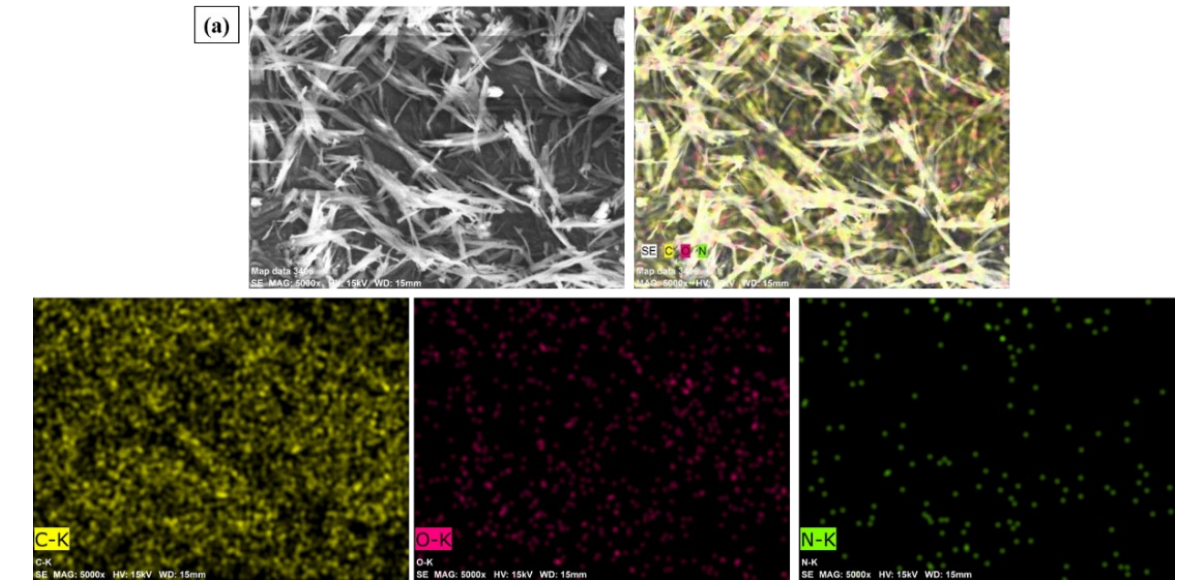


Figure S3b. ^{13}C-NMR of **1**.

Compound	Carbon (C-K)		Nitrogen (N-K)		Oxygen (O-K)		Zinc (Zn-K)	
	Weight (%)	Atomic (%)	Weight (%)	Atomic (%)	Weight (%)	Atomic (%)	Weight (%)	Atomic (%)
HL	75.18	79.24	9.94	8.98	14.88	11.78	-	-
1	67.92	75.35	13.71	13.05	12.50	10.41	5.87	1.20

Figure S4. (a) Composition table showing constituent peaks of C, O and N in **HL**, (b) C, O, N and Zn in **1**.



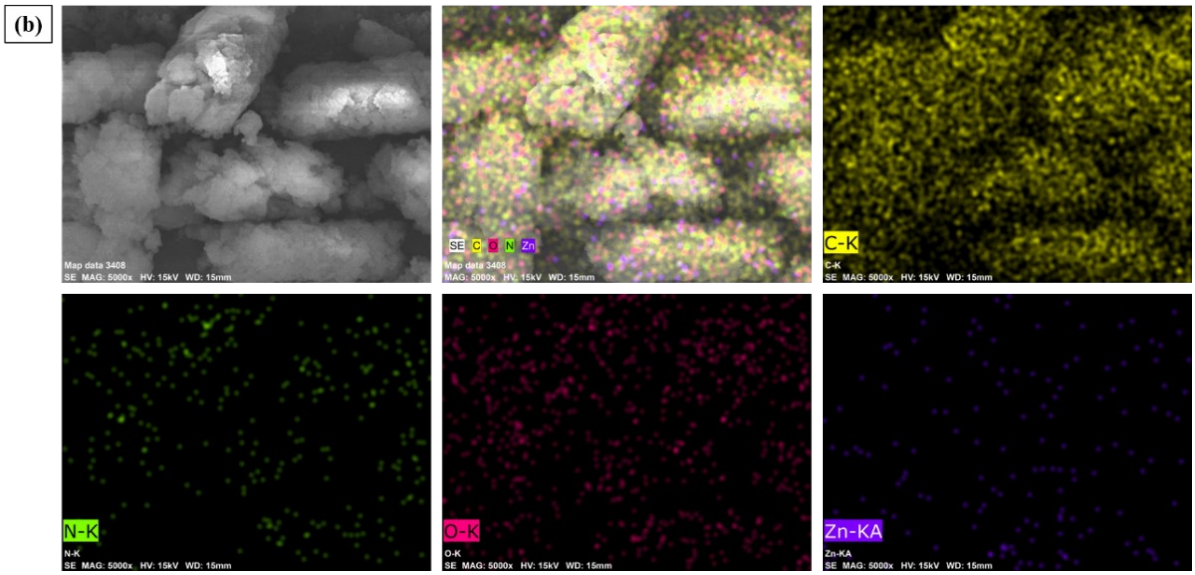


Figure S5. Elemental mapping of (a) **HL**-pristine, (b)**1**-pristine.

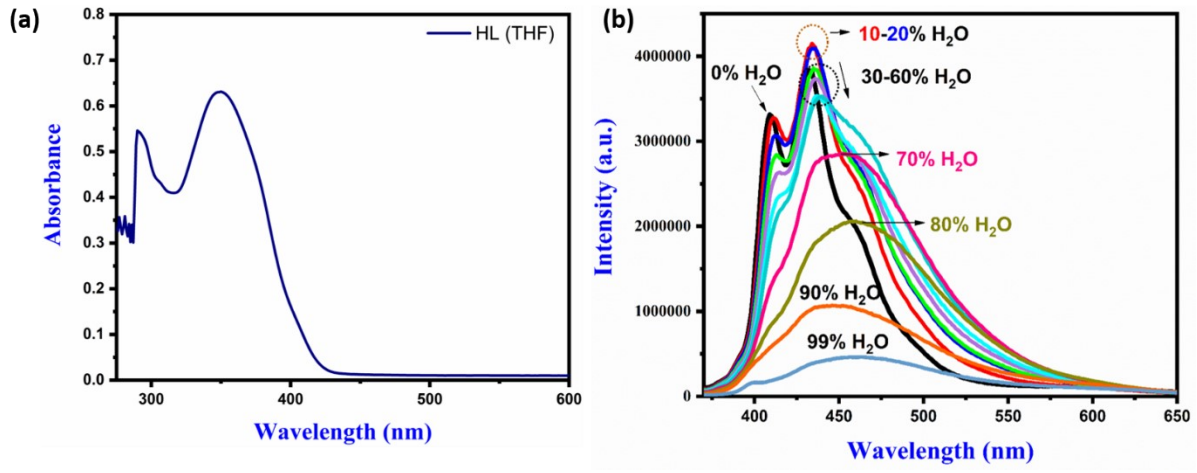


Figure S6. (a) UV-vis spectrum of **HL** (10 μM) in THF, (b) Fluorescence emission spectra of **HL** (10 μM) in THF/H_2O mixtures (0-99% water fraction)

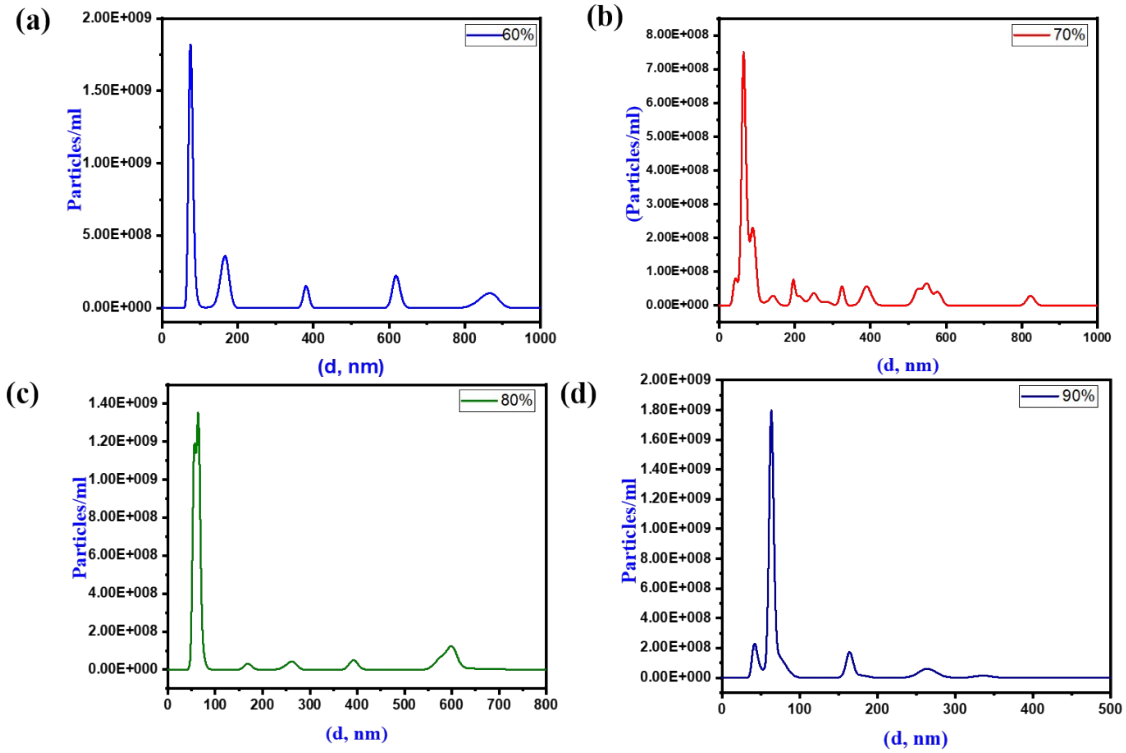


Figure S7. Size distribution from NTA measurements with particles/ml vs particle size (d, nm) plot.

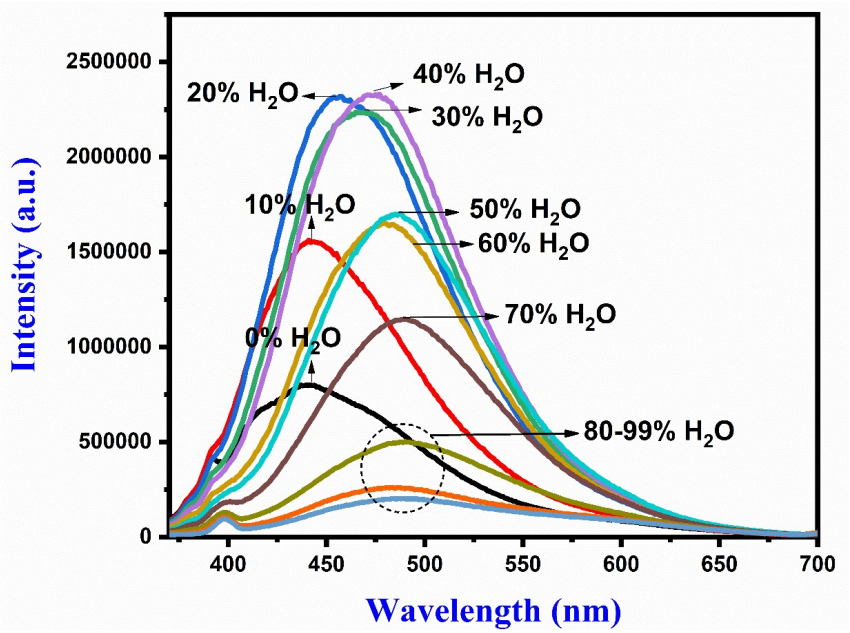


Figure S8. Fluorescence emission spectra of **HL** (10 μM) in DMSO/H_2O mixtures (0-99% water fraction)

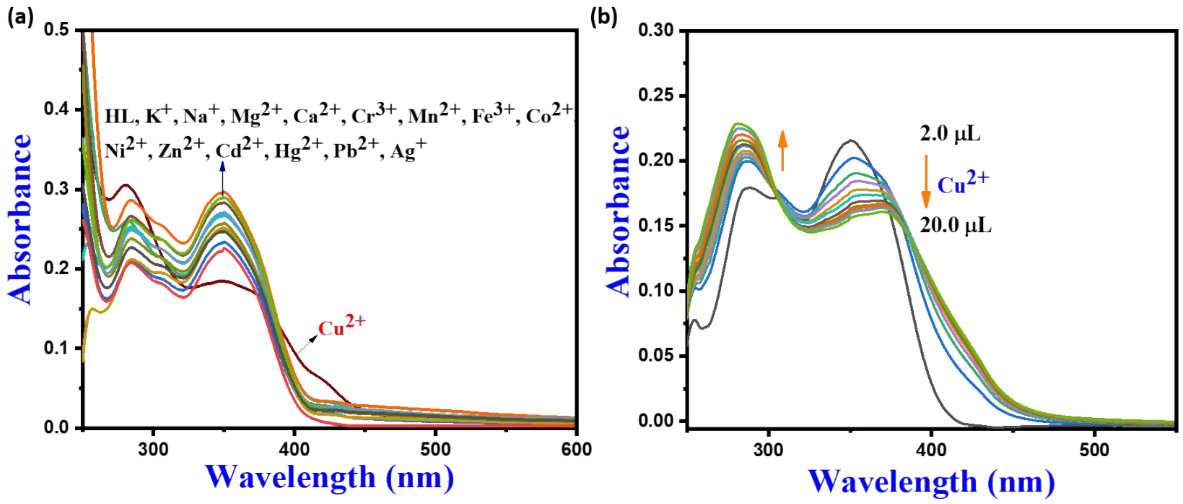


Figure S9. (a) UV-vis spectra of **HL** (10 μM) with various cations in DMSO/H_2O (3:7; v/v) and, (b) UV-vis titration plot of **HL** (10μM) with Cu^{2+} in DMSO/H_2O (3:7; v/v).

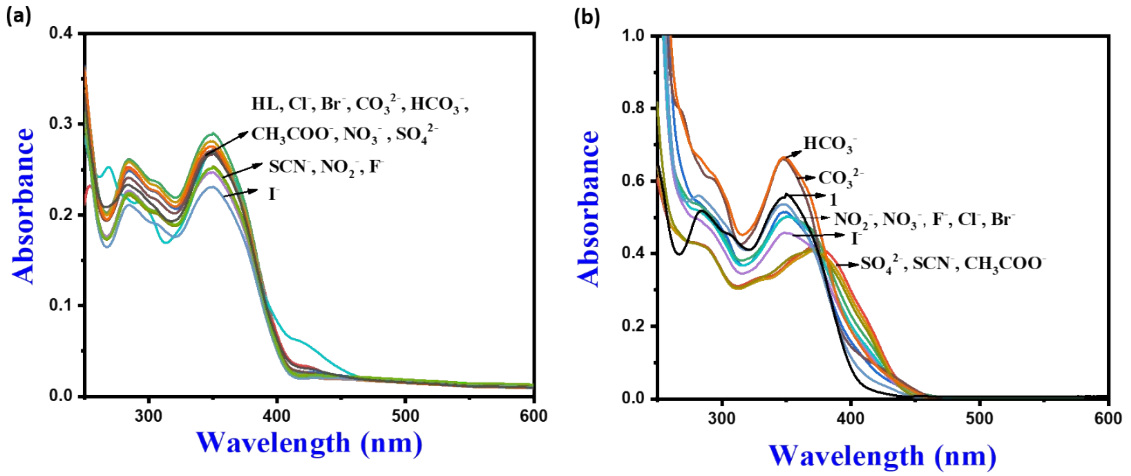


Figure S10. (a) UV-vis spectra of **HL** (10 μM) with various anions in DMSO/H_2O (3:7; v/v), and (b) UV-vis spectra of **1** (10 μM) with various anions in DMSO/H_2O (3:7; v/v).

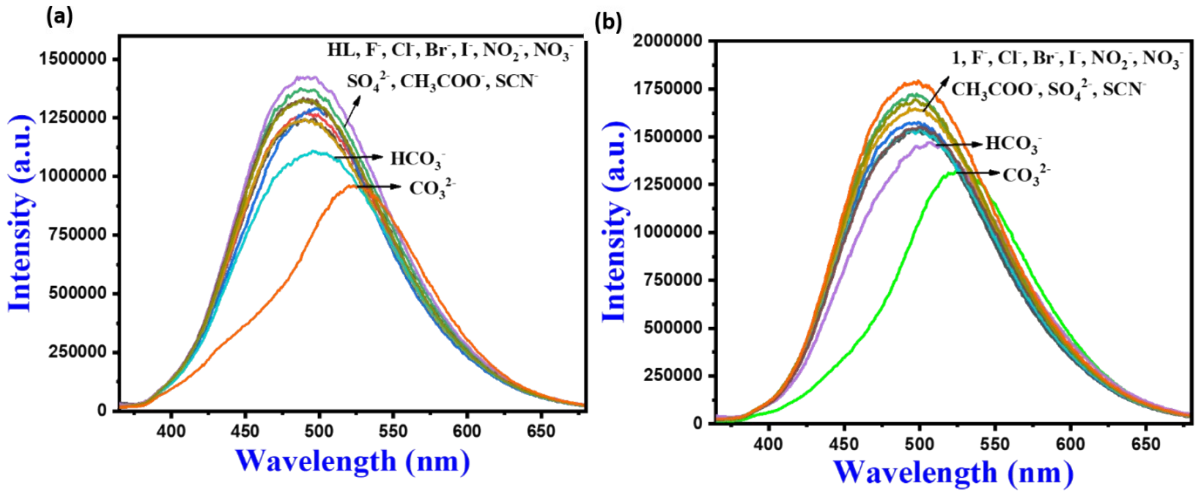


Figure S11. (a) Fluorescence spectra of **HL** (10 μM) with various anions in DMSO/H_2O (3:7; v/v), and (b) Fluorescence spectra of **1** (10 μM) with various anions in DMSO/H_2O (3:7; v/v).

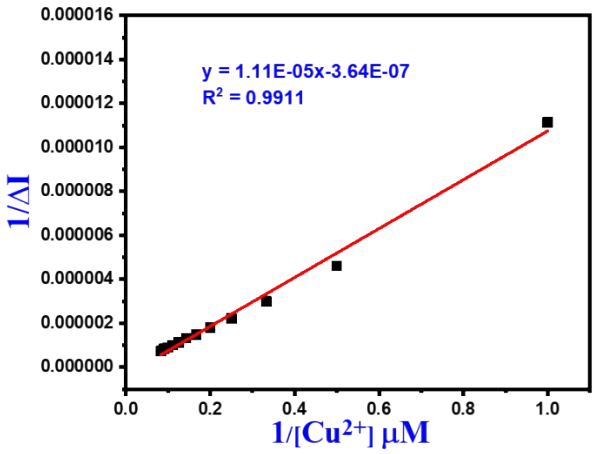


Figure S12. Benesi-Hildebrand plot for binding of **1** with Cu^{2+}.

Figure S13. Stern-Volmer plot for fluorescence quenching of **1** in the presence of Cu^{2+}.

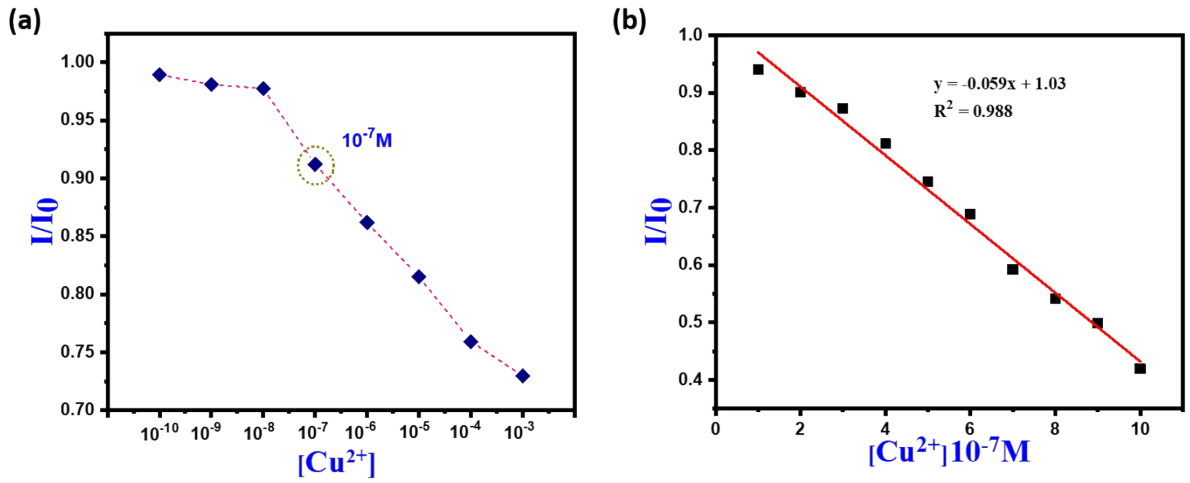


Figure S14. The sensitivity and linearity plots to determine the LOD for binding/interaction of Cu^{2+} with **1** employing fluorescence technique.

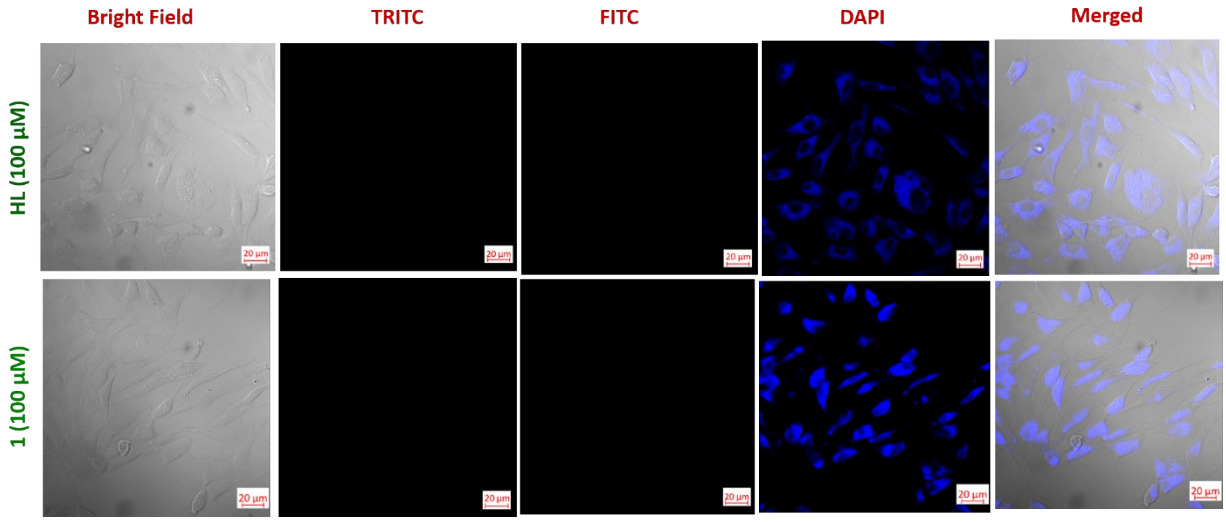


Figure S15. Confocal microscopy images for **HL** and **1** at different filters.