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Supporting Informations for

A metal complex based fluorescent chemodosimeter for selective detection of 2,4-dinitrophenol and picric acid in aqueous medium †

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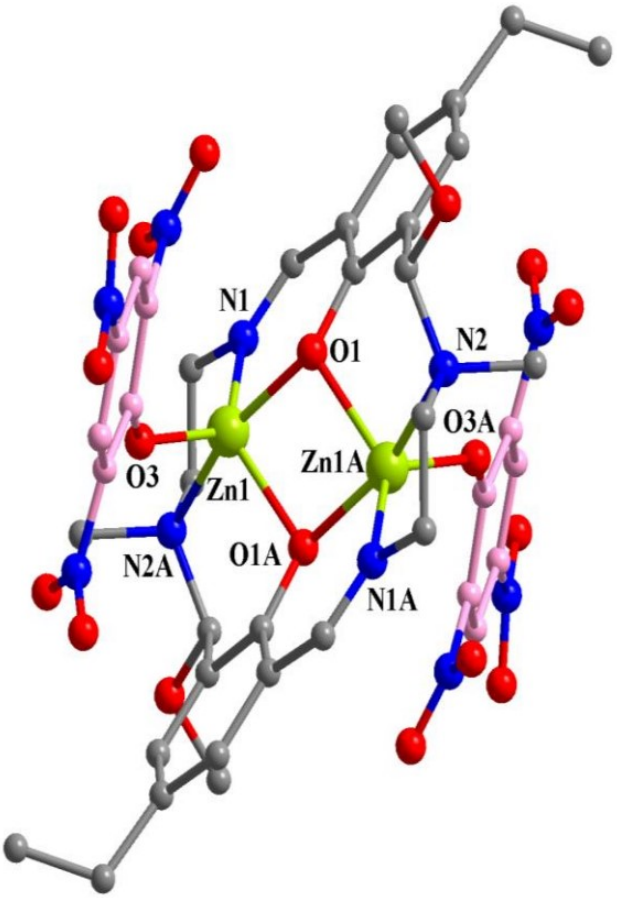


Fig. S1. The crystal structure of $[Zn_2L'(picrate)_2]$ (**3**). All the H-atoms are omitted for clarity.

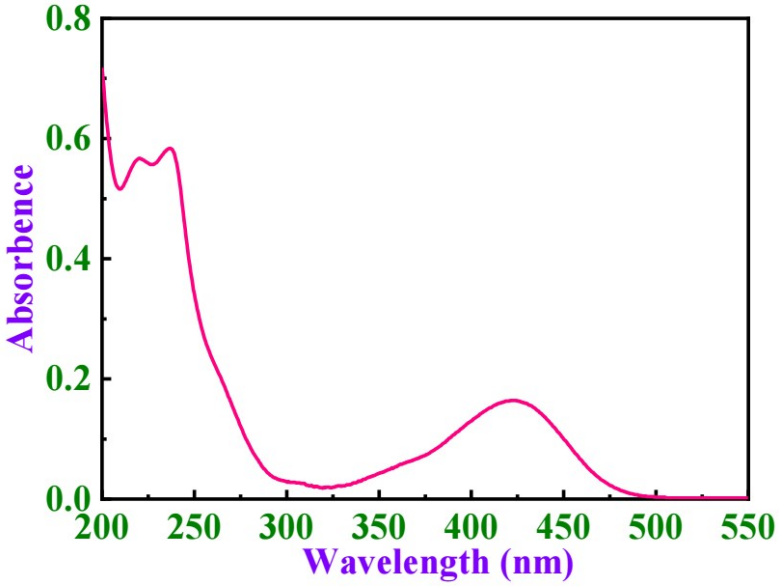


Fig.S2. Electronic spectra of complex $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) in H_2O.

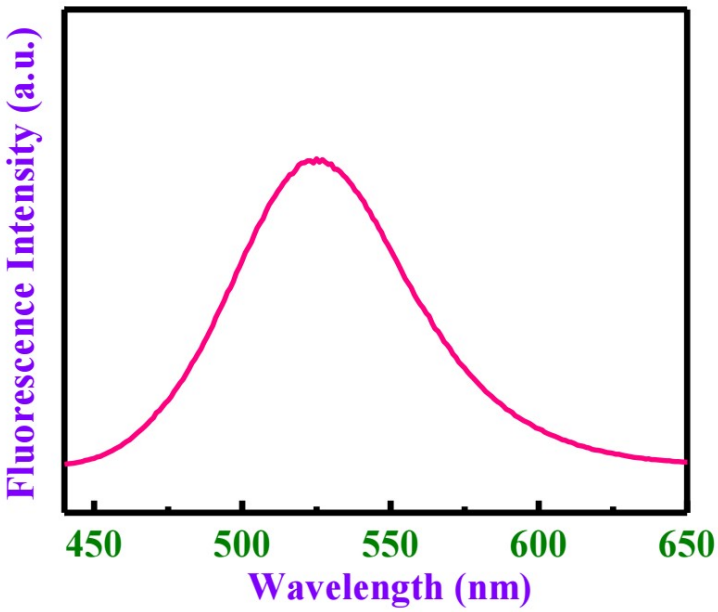


Fig. S3. The fluorescence spectra (20 μM, λ_{ex} = 423 nm) of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) in H_2O.

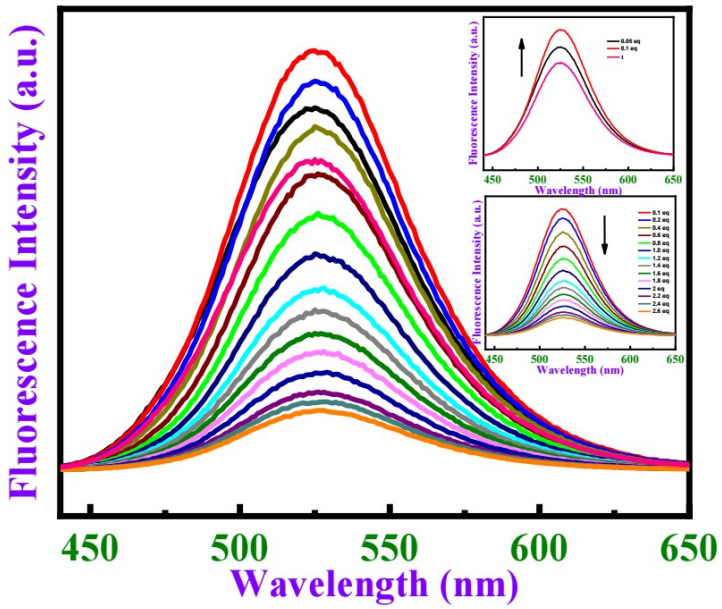


Fig. S4. The change in fluorescence intensity of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) (20 μM, λ_{ex} = 423 nm) in water with the incremental addition of picric acid (PA) in MeOH (H_2O:MeOH = 95:5). The inset shows turn on emission (right) up to 0.1 equivalent of PA and turn off emission (right) below for more than 0.1 equivalent of PA.

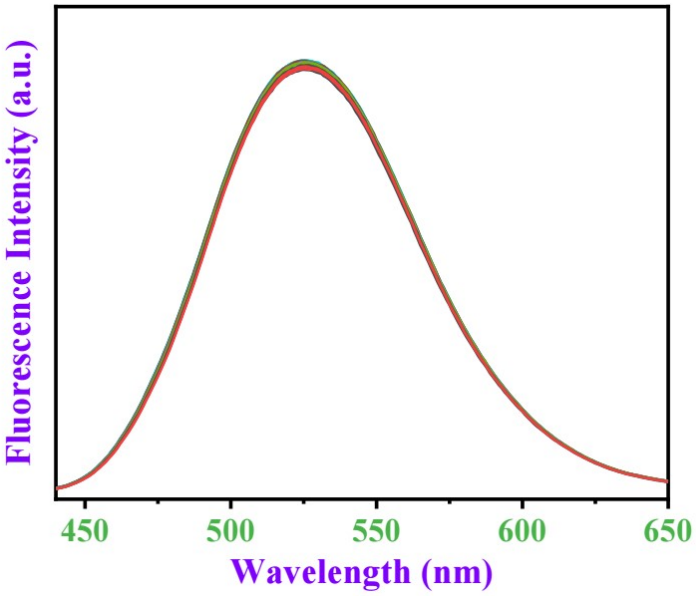


Fig. S5. The fluorescence spectra of 3 mL 20 μM aqueous solution (Solution A) of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) and Solution A + methanol (0.0015−0.078 mL) where methanol was added in incremental way from 0.0015 to 0.078 mL.

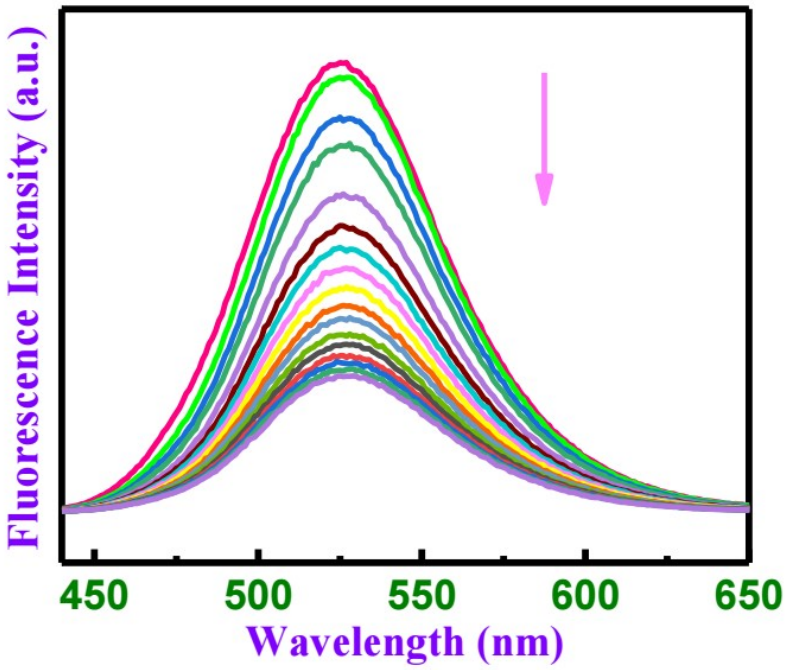


Fig. S6. The change in fluorescence intensity of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) (20 μM, λ_{ex} = 423 nm) with the incremental addition of trifluoroacetic acid (TFA) (H_2O:MeOH = 95:5).

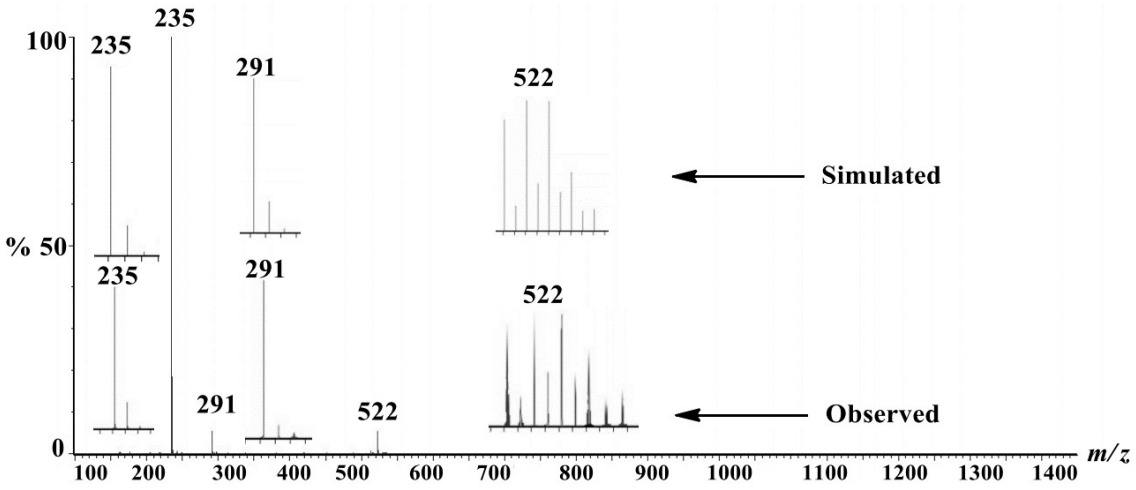


Fig. S7. Electrospray ionization mass spectrum (ESI-MS positive) of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) in water showing observed and simulated isotopic distribution patterns.

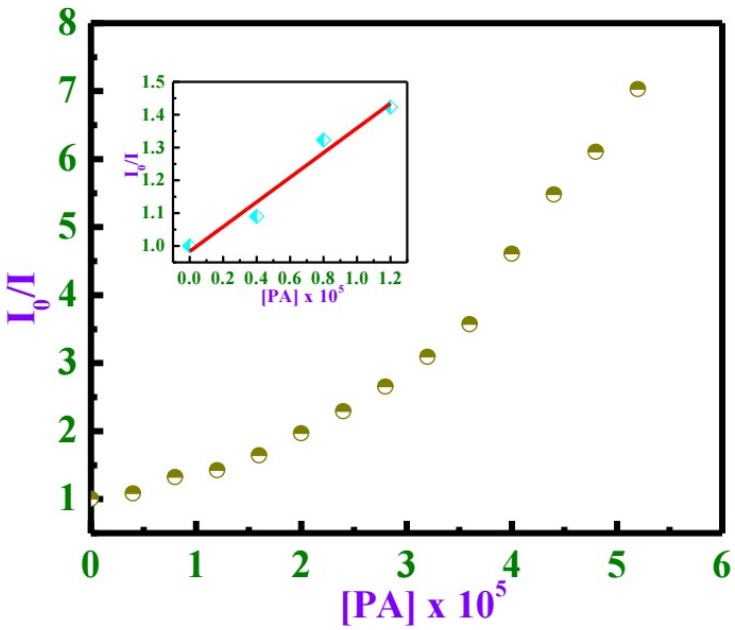


Fig. S8. Stern-Volmer plot of the fluorescence quenching response of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) in water upon addition of picric acid (PA) in MeOH. Inset shows the linear part of the same plot in low concentration region.

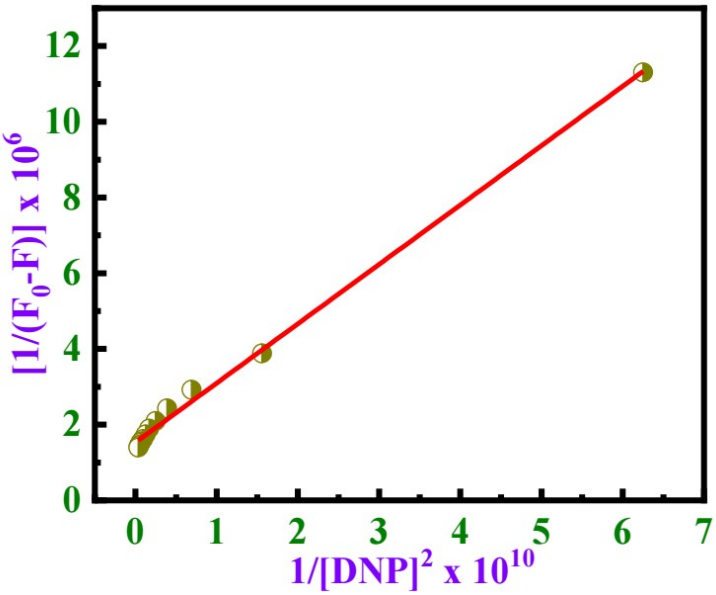


Fig. S9. Benesi-Hildebrand (B−H) plot for 1:2 association complexation between $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) and 2,4-dinitrophenol (DNP).

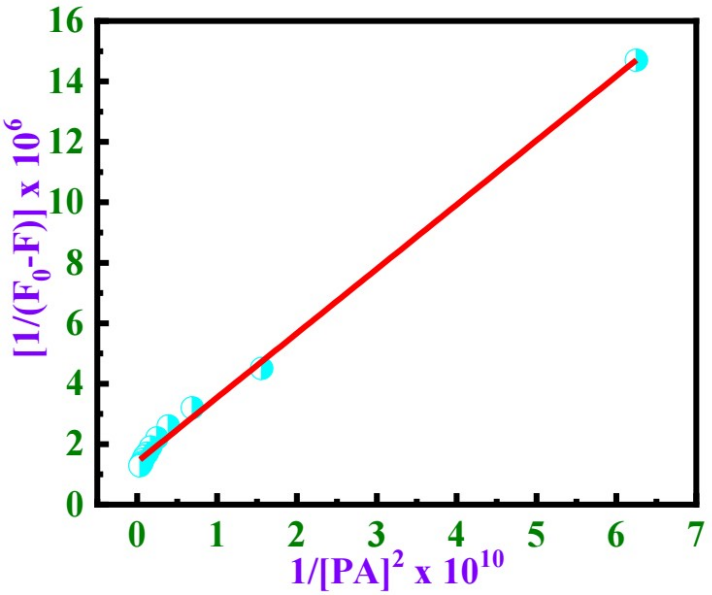


Fig.S10. Benesi-Hildebrand (B−H) plot for 1:2 association complexation between $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) and picric acid (PA).

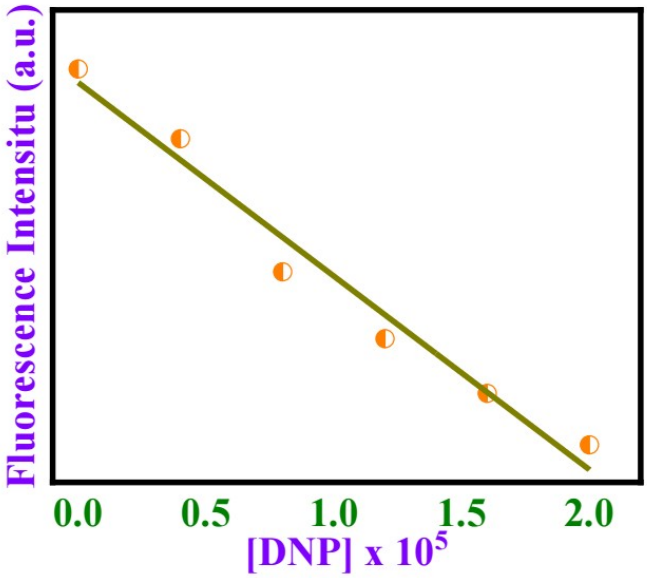


Fig.S11. Plot of limit of detection of complex $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**)toward 2,4-dinitrophenol (DNP) in water-methanol (95:5).

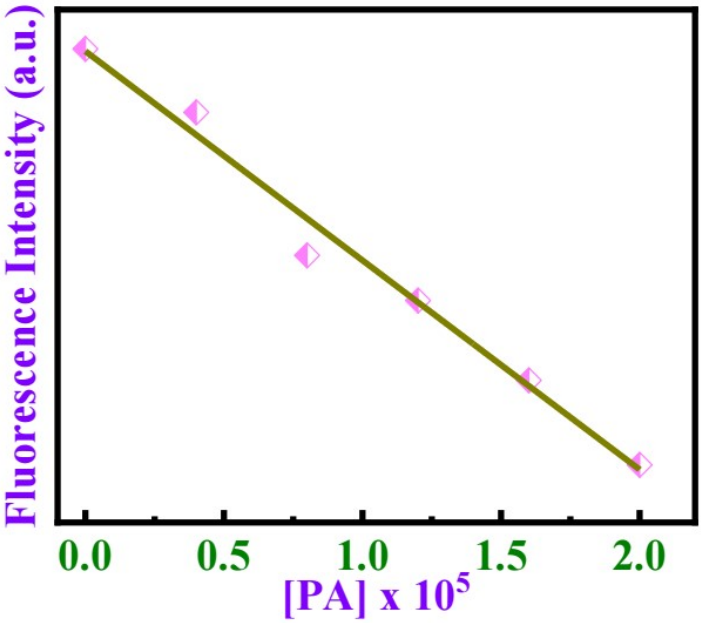
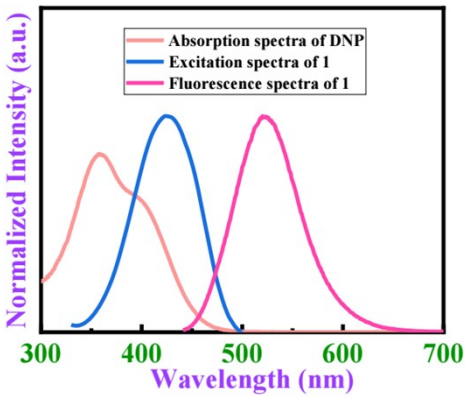
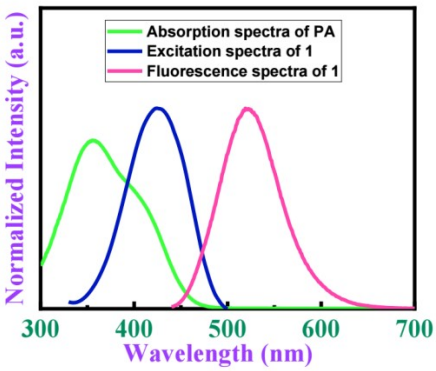


Fig.S12. Plot of limit of detection of complex $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) toward picric acid (PA) in in water-methanol (95:5).





(a) **(b)**

Fig.S13. Overlapping excitation/fluorescence spectra of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) with absorption spectra of (a) 2,4-dinitrophenol (DNP)and (b)picric acid (PA).

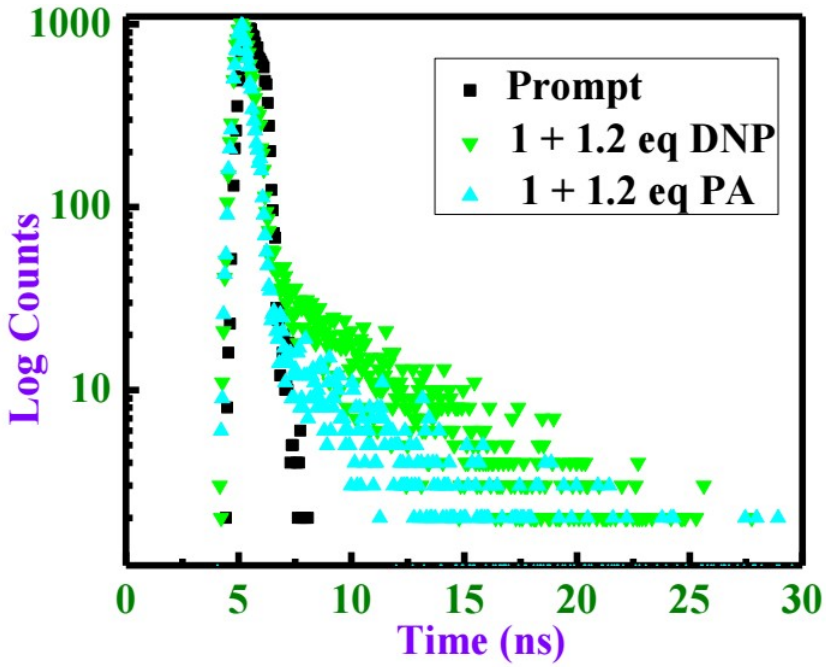


Fig. S14. Time resolved fluorescence decays of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) (20 μM) before and after addition of 2,4-dinitrophenol (DNP)/picric acid (PA). The fluorescence was monitored at 525 nm.

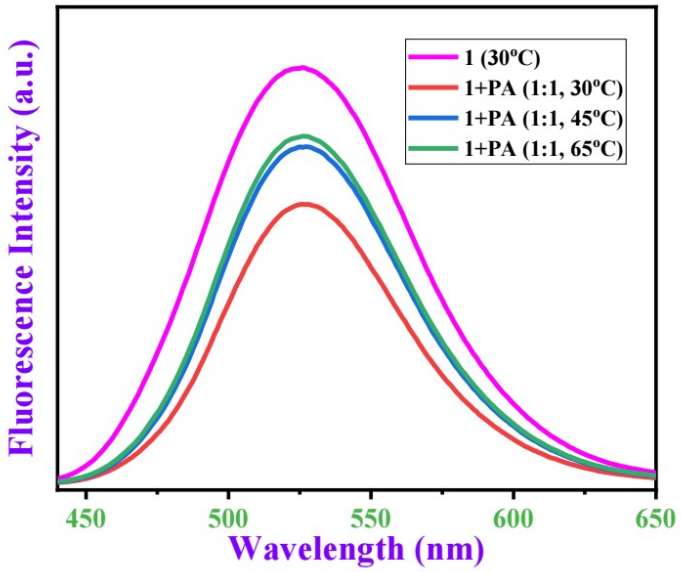


Fig. S15. Fluorescence spectrum of 20 μM aqueous solution of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) at 30 °C and temperature-dependent fluorescence spectra of 1:1 mixture of **1** (20 μM) and picric acid (PA) in water-methanol (95:5). λ_{ex} = 423 nm.

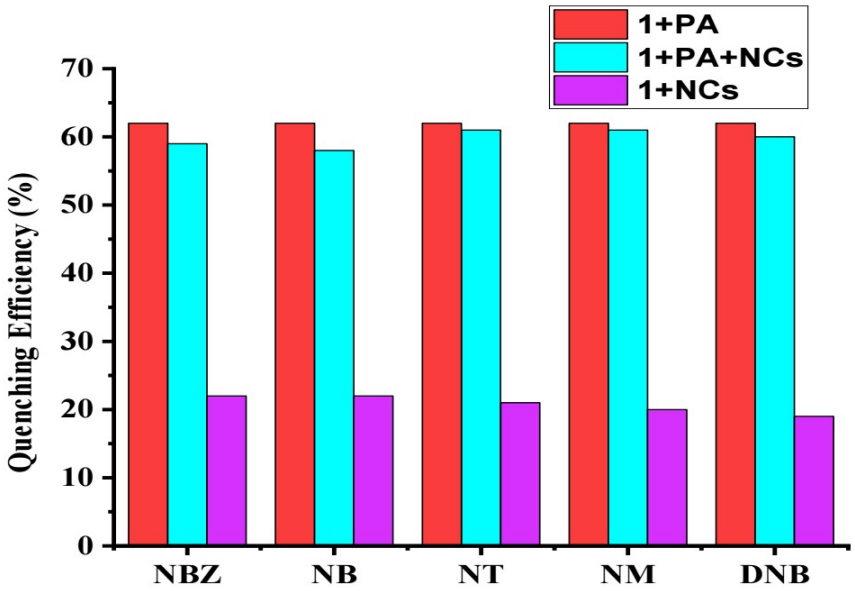


Fig. S16. Bar diagram showing the competition or anti-interference study: relative fluorescence quenching of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**; 20 μM) by 2 equivalents picric acid (PA), 2 equivalents some other nitro compounds (NCs) and mixture of 2 equivalents PA and 2 equivalents NC in water-methanol (95:5). λ_{ex} = 423 nm.

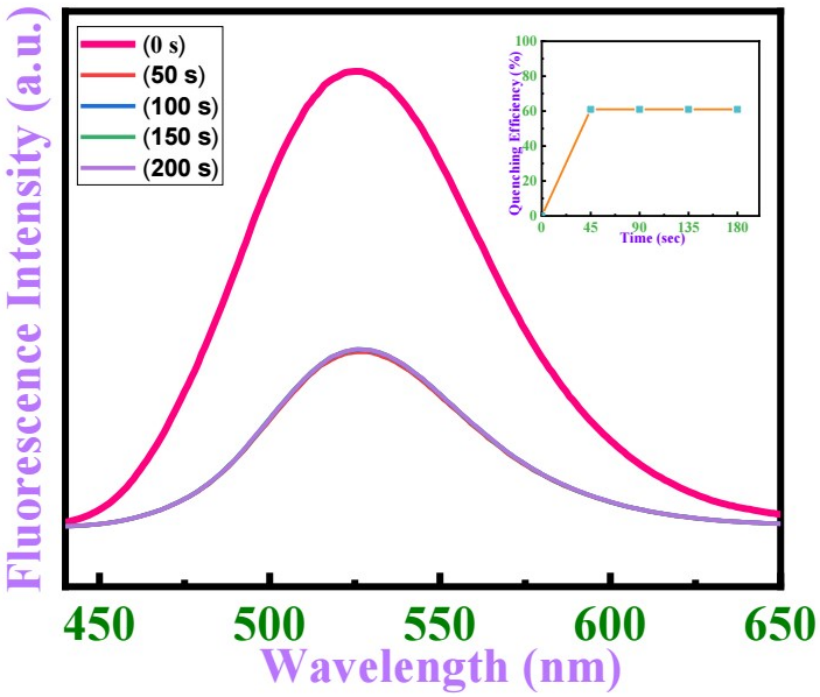
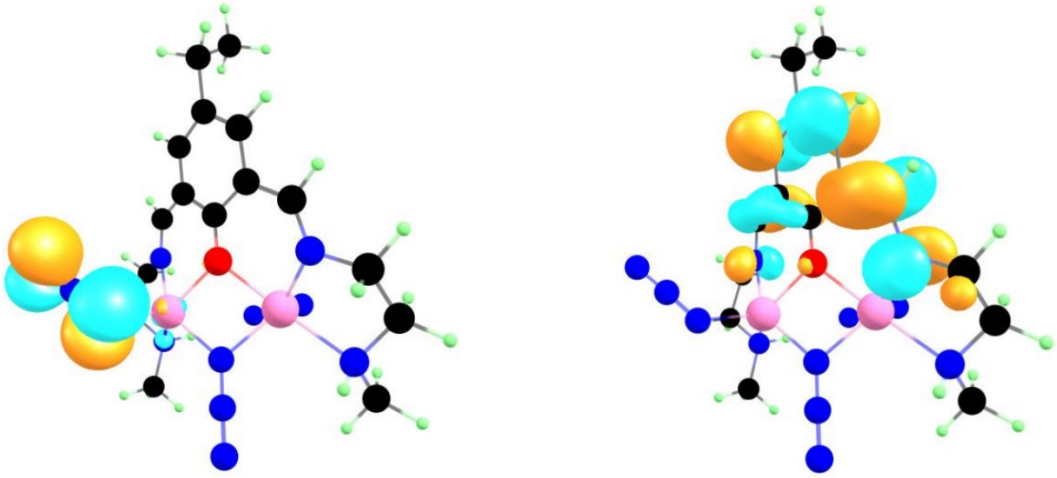
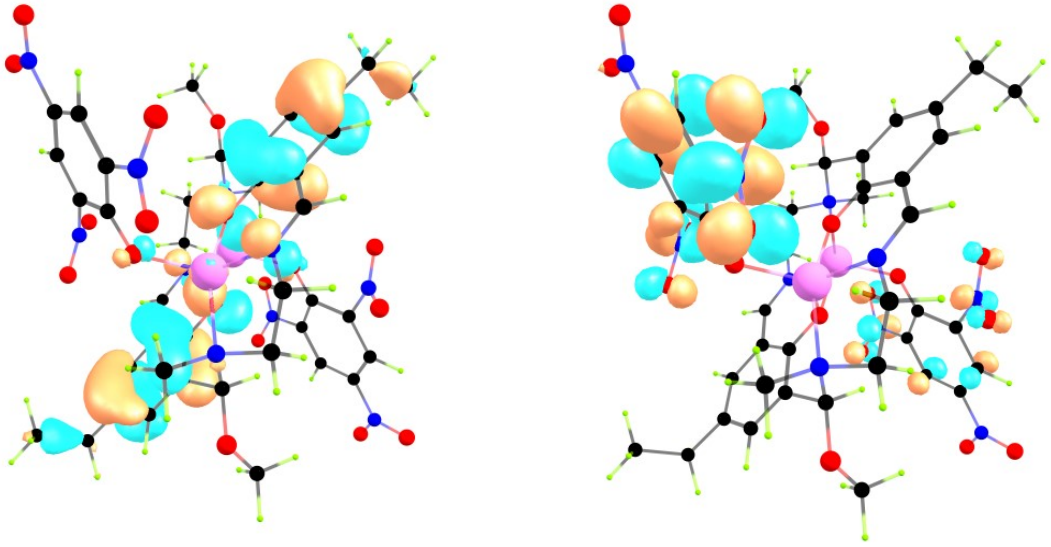


Fig.S17. Time-dependent fluorescence spectra of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**; 20 μM) upon addition of 2 equivalent of picric acid (PA). Inset shows fluorescence quenching efficiency as a function of time. λ_{ex} = 423 nm.



(a) **(b)**

Fig.S18. (a) HOMO and (b) LUMO of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**).



(a) **(b)**

Fig.S19. (a) HOMO and (b) LUMO of $[Zn_2L'(picrate)_2]$ (**3**).

.

Table S1. Crystallographic data for $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**), $[Zn_2L'(2,4\text{-dinitrophenolate})_2]$ (**2**) and $[Zn_2L'(picrate)_2]$ (**3**)

Compound	**1**	**2**	**3**
Empirical formula	$C_{16}H_{25}N_{13}OZn_2$	$C_{40}H_{42}N_{10}O_{18}Zn_2$	$C_{40}H_{44}N_8O_{14}Zn_2$
Formula weight	546.23	1081.57	991.57
Crystal system	monoclinic	triclinic	triclinic
Space group	$P2_1/c$	P-1	P-1
a (Å)	14.3387(7)	9.8225(14)	9.348(2)
b (Å)	10.7536(6)	10.8321(16)	11.044(3)
c (Å)	14.2438(8)	12.0244(18)	12.043(3)
α (°)	90	70.529(2)	68.942(2)
β (°)	90.723(3)	68.630(2)	67.591(2)
γ (°)	90	76.180(2)	89.678(2)
V (Å^3)	2196.1(2)	1113.2(3)	1060.1(5)
Z	4	1	1
D (calculated, g cm^{-3})	1.652	1.613	1.553
λ (Mo K_α), Å	0.71073	0.71073	0.71073
μ(mm^{-1})	2.223	1.167	1.209
T (K)	100 (2)	273(2)	273(2)
F(000)	1120.0	556	512
2θ range for data collection (°)	2.84 to 50.7	3.78–60.276	5.714–57.164
Index ranges	-17 ≤ h ≤ 17	−13≤*h*≤ 13	−12≤*h*≤ 12
	-12 ≤ k ≤ 12	−15≤*k*≤15	−14≤*k*≤ 14
	-17 ≤ l ≤ 17	−16≤*l*≤16	−16 ≤*l*≤ 16
No. measured reflections	29945	25796	20322
No. independent reflections	4022	6160	5385
R_{int}	0.0673	0.0229	0.0402
No. refined parameters	353	319	302
No. observed reflections, $I \geq 2\sigma(I)$	3396	5705	4100
Goodness-of-fit on F^2, *S*	1.163	1.016	1.017
R_1[a], wR_2[b] [$I \geq 2\sigma(I)$]	0.0544, 0.1212	0.0308, 0.1118	0.0386, 0.1008
R_1[a], wR_2[b][all data]	0.0663, 0.1262	0.0335, 0.1153	0.0607, 0.1146
Max., min. electron density (eÅ^{-3})	0.725, -0.801	0.830, –0.493	0.343, -0.353

[a] $R_1 = [\sum||F_o|-|F_c||/\sum|F_o|]$. [b] $wR_2 = [\sum w(F_o^2-F_c^2)^2/\sum w(F_o^2)^2]^{1/2}$

Table S2. Fluorescence life time (τ_{av}) of complex $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) in absence or presence of 2,4-dinitrophenol (DNP)/picric acid (PA) in water.

Entry	τ_{av}(ns)
Complex **1**	4.61
Complex **1** + 0.1 equivalent DNP/PA	0.53/0.62
Complex **1** + 1.2 equivalent DNP/PA	0.51/0.69

Table S3. The ESI-MS positive spectra of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) and mixture of $[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$ (**1**) and picric acid (PA) in water-methanol.

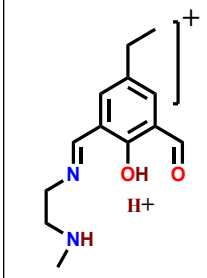
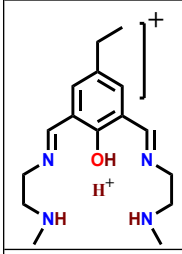
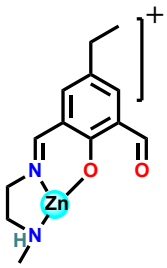
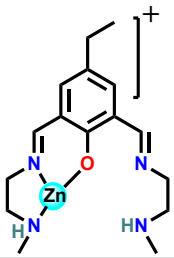
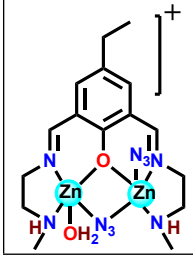
Species illustration	*m/z*	Species formula	Empirical formula	Relative peak intensity	
				1	Mixture
	235	$[(HL'') + H^+]$	$C_{13}H_{19}N_2O_2$	100%	100%
	291	$[(HL) + H^+]$	$C_{16}H_{27}N_4O_1$	5%	–
	297	$[ZnL'']^+$	$C_{13}H_{17}N_2O_2Zn$	–	8%
	353	$[ZnL]^+$	$C_{16}H_{25}N_4O_1Zn$	–	8%
	522	$[Zn_2^{II}L(\mu\text{-}N_3)(N_3)_2(H_2O)]^+$	$C_{16}H_{27}N_{10}O_2Zn_2$	8%	5%

Table S4. Comparison of Stern-Volmer constant (K_{sv}), detection limit (LOD) and association constant (K_a) of different fluorescence probes reported for the detection of explosive nitro aromatics.

Sl. No.	Fluorescent Probe	Type	SC-XRD of Probe	SC-XRD of [Probe–NACs] complex	K_{SV} (M^{-1})	K_a	Detection Limit (µM), LOD	Solvent System	Ref.
1	3,5-bis(acetal)BODIPY	Organic-Chemodosimeter	No	No	–	9.2×10^6 M^{-1}	0.71 µM, 162 ppb (PA)	(1:9) H_2O: CH_3CN	1
2	$[Zn^{II}_2L(\mu_{1,1}\text{-}N_3)(N_3)_2]$	Discrete metallo-organic Chemodosimeter	Yes	Yes	5.55×10^4(DNP)	9.74×10^9 M^{-2}(DNP)	1.85 µM ,0.423 ppm (DNP)	(95:5) H_2O:MeOH	This Work
					3.5×10^4 (PA)	6.65×10^9 M^{-2}(PA)	2.21 µM,0.506ppm (PA)		
3	Polyhedral oligosilsesquioxane	Organic-inorganic hybride nanomaterial	No	No	170000 (PA)		2.84 µM, 0.65 ppm (PA)	(1:9) THF:Water	2
					2790 (DNP)		28.38 µM, 6.5 ppm (DNP)		
4	Organic molecule	Chemosensor	No	No	3×10^4 (PA)		0.001 µM, 0.29 ppb (PA)	(1:9) THF:Water	3
					8×10^4 (DNP)		0.005 µM, 1.14 ppb (DNP)		
5	$[Hg(L^1)_2(ClO_4)2]n$	Coordination polymer Chemosensor	Yes	No	3.25×10^5 (PA)		2.4 µM, 0.55 ppm (PA)	Aqueous	4
					2.11×10^5 (DNP)		3.1 µM, 0.57 ppm (DNP)		
					7.5×10^4 (PNP)		4.5 µM, 0.63 ppm (PNP)		
					2.04×10^4 (3-NP)		12.1 µM, 1.68 ppm (3-NP)		
					6.33×10^4 (4-NA)		5.2 µM, 0.72 ppm (4-NA)		
					4.75×10^4 (4-ANP)		5.9 µM, 0.91 ppm (4-ANP)		
					3.86×10^4 (2-NP)		7.5 µM, 1.04 ppm (2-NP)		
					2.81×10^4 (2-NA)		7.9 µM, 1.09 ppm (2-NA)		
					1.95×10^4 (CDNB)		12.4 µM, 2.50		

							ppm (CDNB)		
					1.62×10^4 (CNB)		13.5 µM, 2.12 ppm (CNB)		
					7.25×10^3 (NPA)		29.04 µM, 4.79 ppm (NPA)		
6	MoS_2 Quantum dots	Chemosensor	No	No	7.4310×10^5 (PA) 1.0012×10^5 (1,2-DNB) 9.8121×10^4 (1,3-DNB) 1.6179×10^5 (1,4-DNB) 1.0011×10^5 (2,6-DNT) 1.0643×10^5 (2-NT) 1.0161×10^5 (4-NT) 1.1150×10^5 (NB)	–	8.90 µM, 2.04 ppm (PA)	Aqueous pH 7.0	5
7	$[Cu_2L^2(\mu\text{-}Cl)_2]Cl \cdot 4.5H_2O$	Chemosensor	Yes	Yes	1.1×10^5 (PA)	$4.64 \times 10^{10} M^{-2}$(PA)	4.8 µM (1.099 ppm)	Pure water	6
8	Amphiphilic Carbon dots	Chemosensor	No	No	1.22×10^4 (PA)	–	(0.23–1.31) µM, (0.05–0.3) ppm (PA)	Various solvent including water	7
9	$[Zn_2(L^3)_2(bpy)] \cdot (G_s)_x$	MOF-Chemosensor	Yes	Yes	11.6257×10^3 (NT) 5.093×10^3 (DNT) 4.499×10^3 (TNT) 3.05×10^3 (NB) 1.548×10^3 (DNB) 4.224×10^3 (PA)	–	–	Ethanol	8
10	Π-conjugated organic copolymers	Chemosensor			$2.84–6.4 \times 10^4$ (PA) $1.71–2.45 \times$	–	0.525–0.951 µM, 0.12–0.22	Chloroform	9

			No	No	10^4(DNP) $(2.58–4.40) \times 10^3$ (NB) $(2.03–2.21) \times 10^3$ (NT) $(1.15–1.23) \times 10^4$ (NBA) $(1.33–1.45) \times 10^4$ (PNP) $(1.91–2.66) \times 10^4$ (2,6-DNT)				
11	Organic molecule	Chemosensor	Yes	Yes	4.31×10^4 (PA)	–	2.18 µ M, 500 ppb (PA)	THF	10
12	$[PbL^4(OAc)]$	Discrete metallo-organic Chemosensor	Yes	No	5.7×10^3 (1,3 DNB) 1.4×10^3 (4-NT) 2.4×10^3 (4-NBA) 1.1×10^3 (2,6-DNT)		20.55 µM, 5.84 ppm (1,3 DNB) 30.54 µM, 8.11 ppm (4-NT) 7.72 µM, 17.64 ppm (4-NBA) 1.16 µM, 265.4 ppb (2,6-DNT)	(6:4) DMSO:Water	11
13	Trimethylsilylethynyl functionality based organic molecule	Chemosensor	No	No	$(1.1 \times 10^4 – 2.15 \times 10^5)$(PA) $(1.4 \times 10^3 – 1.97 \times 10^4)$(TNT)	–	0.0345 µ M, 8 ppb (PA) –	$CHCl_3$:MeOH	12
14	$[Zn_2L^5Cl_2(H_2O)]$	Discrete metallo-organic Chemosensor	Yes	No	8.063×10^4 (PA)	–	0.003986 µM, 912 ppt (PA)	MeOH	13
15	$[Zn_2L^5(SCN)_2(H_2O)]\cdot H_2O$	Discrete metallo-organic Chemosensor	Yes	No	7.987×10^4 (PA)	–	0.003974 µM, 910 ppt (PA)	MeOH	
16	$[Zn_2L^5(N_3)(CH_3CO_2)]$	Discrete metallo-organic Chemosensor	Yes	No	8.51×10^4 (PA)	–	0.003914 µM, 896 ppt (PA)	MeOH	
17	$[BiL^6(NO_3)]_n$	Polymeric metallo-organic Chemosensor	Yes	No	2.96×10^6 (NB) 3.22×10^5 (4-NP)		0.11 µM (25.19 ppb) (NB) 0.147 µM (33.66 ppb) (4-NP)	DMF	14

					4.16×10^5 (DNP)		0.638 µM (146.1 ppb) (2,4-DNP)		
					1.87×10^6 (PA)		0.0968 µM (22.16 ppb) (PA)		
	$[BiL^7(NO_3)_3]$	Discrete metallo-organic Chemosensor	No	No	1.83×10^5 (DNP)		0.131 µM (30 ppb) (DNP)	DMF	
					4.58×10^5 (PA)		0.0924 µM, (21.16 ppb) (PA)		
18	$[Zn_2L^8(\mu_{1,5}\text{-dca})_2(\mu_1\text{-dca})]_n$	Multinuclear Zn Complex Chemosensor	Yes	No	1.542×10^4 (PA)		0.43 µM, 0.0985 ppm (PA)	DMF	15
19	[Cd(cis-chdc)(anti-bpe)$(H_2O)]_n$	MOF-Chemosensor	Yes	No	2.64×10^4 (4-NT)	–	–	DMF	16
					5.04×10^3(NB)				
					4.43×10^3(1,3-DNB)				
					6.21×10^3(2,4-DNT)				
					3.87×10^3(2,6-DNT)				
					3.10×10^3(TNT)				
20	$[(Zn_4O)(H_2O)_2(TPA)_2]\cdot 8DMA$	MOF-Chemosensor	Yes	No	3.95×10^2 (NB)	–	175 µM, 40.07 ppm (NB)	N,N-dimethylacetamide (DMA)	17
					2.70×10^3 (1,2-DNB)		25.6 µM, 5.86 ppm (1,2-DNB)		
					2.34×10^3 (1,3-DNB)		29.5 µM, 6.76 ppm (1,3-DNB)		
					8.35×10^3 (TNB)		8.26 µM, 1.89 ppm (TNB)		
					1.14×10^5 (PA)		0.6 µM, 0.137 ppm (PA)		
21	[Ag(HMCTCA)(H_2MCTCA)	Discrete metallo-organic Chemosensor	Yes	No	9.15×10^4 (PA)	–	0.88 µM, 0.2015 ppm (PA)	EtOH	18
					1.37×10^5 (PNA)		0.59 µM, 0.135 ppm (PNA)		
					4.03×10^4 (PNP)		2.03 µM, 0.4649 ppm (PNP)		
					6.63×10^4 (PNT)		1.22 µM,		

					6.96 × 10^4 (NB)		0.2794 ppm (PNT) 1.17 µM, 0.267 ppm (NB)		
22	Organometallic Pt_3 based Nanoscopic Prism	Chemosensor	Yes	No	48.1 × 10^3 (PA) 19.6 × 10^3 (TNT)	–	–	(4:1) CH_2Cl_2:DMF	19
23	Pd^{II}-Organometallic Molecular rectangles	Chemosensor	Yes	No	(1.9−3.1) × 10^4 (PA)	–	–	THF/$CHCl_3$	20
24	TAPB	Organic-supramolecular Chemosensor	Yes	Yes	1.2×10^5 (PA) 4.0×10^3 (TNT) 2.6×10^3 (*m*-DNB) 8.3×10^3 (DNT) 8.0×10^3 (*p*-DNB)	– – – – –	– – – – –	CH_3CN	21,22
25	([(N,N)Me_2]$_3$TAPB)	Discrete Organic Chemosensor	No	Yes	3.31×10^5 (PA) 1.90×10^3 (TNT) 3.03×10^3 (*m*-DNB) 1.23×10^3 (DNT) 5.44×10^3 (*p*-DNB)	2.0×10^8 9.0×10^5 6.7×10^5 6.0×10^5 2.5×10^6	6.55 µM, 1.50 ppm (PA)	CH_3CN	23
26	[NHMe]$_3$TAPB	Organic Chemosensor	Yes	No	2.8 ×10^5 (PA) 1.1 × 10^3 (TNT) 1.7 × 10^3 (*m*-DNB) 4.4 × 10^3 (DNT) 7.0 × 10^3 (*p*-DNB)	–	–	CH_3CN	24
27	$Ti_6(\mu_3\text{-}O)_6(\mu_2\text{-}OH)_6(L^9)_2(DMF)_2$	MOF-Chemosensor	Yes	No	2.26 ×10^4(PA)	–	2.37 µM, 0.54 ppm (PA)	Ethanol suspension	25
28	[{$Cu_2(L^{10})(oba)_2$}·DMF·H_2O]$_\alpha$	MOF-Chemosensor	Yes	No	1.49 ×10^5 (4-NA) 1.34 × 10^5(4-NPH) 0.31 × 10^5(*PA*)	–	14.07 µM, 3.2 ppm (4-NA) 18.76 µM, 4.30 ppm (4-NPH) 22.65 µM, 5.19 ppm (PA)	DMF	26
29	[(Zn_2(NDC)$_2$(bpy)·Gx}	MOF-Chemosensor	Yes	No	1.5 × 10^4(2,4-DNP) 3.32 × 10^4 (2NT)		0.284µM, 0.065 ppm (2,4-DNP) 0.315µM, 0.072 ppm (2NT)	Ethanol	27

					1.06×10^4 (4-NP) 4.65×10^4 (NB)		0.347µM, 0.079 ppm (4-NP) 0.322µM, 0.074 ppm (NB)		

K_a = Association constant; K_{SV} = Stern-Volmer quenching constant

HL = 2,6-bis[2-(methylamino)ethyliminomethyl]-4-ethylphenol; L^1 = 1,3,5-tris(benzimidazolelymethyl)benzene; HL^2 = 2,6-bis[N-(2-pyridylethyl)formidoyl]-4-ethylphenol;L^3 = 2,6-naphthalenedicarboxylic acid; bpy = 4,4'-bipyridine; G_s = guest solvent molecule; HL^4 = 2[(3,5 Dichloro 2 hydroxy benzylidene)amino] 2hydroxymethyl propane-1,3-diol; H_2L^5 = N,N'-dimethyl-N,N'bis(2-hydroxy-3-methoxy-5-methylbenzyl)ethylenediamine; H_2L^6 = (1: 2 condensation product of 2,6-diformylpyridine and pyridine-4-cabohydrazide); L^7 =(1: 2 condensation product of 2,6-diformylpyridine and 4-aminoantipyrine); H_2L^8 = N,N'-bis(3-ethoxysalicylidene)-2,2-dimethyl-1,3-propanediamine; H_2chdc = 1,4-cyclohexanedicarboxylic acid;bpe = 1,2-bis(4-pyridyl)ethane; H_3TPA = 4,4',4"-nitrilotribenzoic acid, DMA = N,N'-dimethylacetamide; H_2MCTCA = 5-Methyl-1-(4-carboxylphenyl)-1H-1,2,3-triazole-4-carboxylic acid; TAPB = 1,3,5-tris(4'-aminophenyl)benzene; H_3L^9 = 1,3,5-(4-carboxyphenyl)benzene; L^{10} = N^2,N^6-di(pyridine-4-yl)naphthalene-2,6-dicarboxamide; oba = 4,4'-oxybis(benzoate); NDC = 2,6-naphthalene dicarboxylic acid.

PA = 2,4,6-trinitrophenol; DNP = 2,4-dinitrophenol; PNA = p-nitroaniline; PNP = p-nitrophenol; 2-NP = 2-nitrophenol; 3-NP = 3-nitrophenol; PNT = p-nitrotoluene; NT = Nitrotoluene; NB = nitrobenzene; 1,2-DNB = 1,2-dinitrobenzene; *m*-DNB or 1,3-DNB = 1,3-dinitrobenzene; *p*-DNB or 1,4-DNB = 1,4-dinitrobenzene; TNB = 1,3,5-trinitrobenzene; 2-NT = 2-nitrotoluene; 4-NT = 4-nitrotoluene; 2,4-DNT = 2,4-dinitrotoluene; 2,6-DNT = 2,6-dinitrotoluene; TNT = 2,4,6-trinitrotoluene; NBA = Nitrobenzoic acid; 2-NA = 2-nitroaniline; 4-NA = 4-nitroaniline; 4-ANP = 2-amino-4-nitrophenol; CDNB = 1-chloro-2,4-dinitrobenzene; CNB = 1-chloro-4-nitrobenzene; NPA = 4'-nitroacetophenone; 4-NA = 4-nitroaniline; 4-NPH = 4-nitrophenylhydrazine; 4-NP = 4-nitrophenol

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