*Electronic Supplementary Information (ESI) for*

# Luminescence Sensing and Photocatalytic Activities of Four Zn(II)/Co(II) Coordination Polymers Based on Pyridinephenyl Bifunctional Ligand

Yun-Shan Xue,[a] Chen Zhang,[a] Jun Qing Lv,[a] Ning-Ning Chen,[a] Jun Wang,[*a] Xuan-Rong Chen,[a] and Liming Fan[*b]

[a]*School of Chemistry & Environmental Engineering, Yancheng Teachers University, Yancheng, 224007, China.*
[b]*Department of Chemistry, College of Science, North University of China, Taiyuan 030051, China.*

*E-mail: wjyctu@hotmail.com*; *limingfan@nuc.edu.cn.*

## Table of Contents

## Experimental Section

### Materials and Methods

All the starting reagents were purchased from commercial sources and used without further purification. Elemental analyses (C, H and N) were carried out using a Perkin Elmer 240C elemental analyzer. Infrared spectra (KBr pellet) were obtained (4000–400 $cm^{-1}$ region) using a VERTEX 80 spectrometer. Powder X-ray diffraction (PXRD) patterns were collected on a Shimadzu XRD-6000 X-ray diffractometer with Cu–Kα (λ = 1.5418 Å) radiation at room temperature. Thermogravimetric analysis (TGA) were carried out on a Netzsch STA-449 *F*5 Jupiter-simultaneous TG-DSC analyzer from room temperature to 800 °C under an $N_2$ atmosphere and a heating rate of 10 °C·$min^{-1}$. The UV–Vis absorption spectra were undertaken on a Perkin Elmer Lambda 25 spectrophotometer. The fluorescence spectra were collected by using a Perkin Elmer LS 55 fluorescence spectrometer.

**Synthesis of $\{[Zn(BIMB)(HL)]\cdot H_2O\}_n$ (1)**

A mixture of $Zn(NO_3)_2\cdot 6H_2O$ (14.9 mg, 0.05 mmol), $H_3L$ (14.4 mg, 0.05 mmol), BIMB (15.7 mg, 0.05 mmol) and $H_2O$ (3 mL) was stirred at room temperature for 15 min, then sealed in a 10 mL Teflonlined stainless steel vessel, and heated at 100 °C for 3 days, followed by cooling to room temperature at a rate of 10 °C·$h^{-1}$. Colorless block-shaped crystals of **1** were obtained, washed with distilled water, and dried (yield 67.1 % based on $Zn(NO_3)_2\cdot 6H_2O$). Anal. Calcd for $C_{34}H_{27}N_5O_7Zn$: C, 59.79; H, 3.98; N, 10.25. Found: C, 59.87; H, 3.99; N, 10.28%. IR (KBr, $cm^{-1}$): 3568 m, 3463 m, 3142 m, 1711 s, 1625 s, 1578 s, 1519 m, 1434 m, 1391 s, 1346 s, 1259 w, 1201 m, 1152 w, 1114 m, 1092 s, 1006 w, 954 m, 828 m, 745 s, 692 m, 665 m, 657 m, 499 w, 449 w.

**Synthesis of $[Co(BIMB)(HL)(H_2O)]_n$ (2)**

A mixture of $Co(NO_3)_2\cdot 6H_2O$ (14.6 mg, 0.05 mmol), $H_3L$ (14.4 mg, 0.05 mmol), BIMB (15.7 mg, 0.05 mmol), and $H_2O$ (3 mL) was stirred at room temperature for 15 min, then sealed in a 10 mL Teflonlined stainless steel vessel, and heated at 100 °C for 3 days, followed by cooling to room temperature at a rate of 10 °C·$h^{-1}$. Red block-shaped crystals of **2** were obtained, washed with distilled water, and dried (yield 71.3% based on $Co(NO_3)_2\cdot 6H_2O$). Anal. Calcd for $C_{34}H_{27}CoN_5O_7$: C, 60.36; H, 4.02; N, 10.35. Found: C, 60.50; H, 4.03; N, 10.37%. IR (KBr, $cm^{-1}$): 3613 w, 3447 m, 3125 m, 1676 m, 1616 s, 1570 s, 1522 s, 1400 s, 1372 s, 1306 m, 1247 m, 1162 w, 1107 m, 1084 m, 1029 w, 1005 w, 945 w, 816 m, 747 s, 700 m, 655 m, 540 w, 447 w**.**

**Synthesis of $\{[Zn_2(BIBP)_2(HL)_2]\cdot 2H_2O\}_n$ (3)**

A mixture of $Zn(NO_3)_2\cdot 6H_2O$ (14.9 mg, 0.05 mmol), $H_3L$ (14.4 mg, 0.05 mmol), BIBP (12.8 mg, 0.05 mmol), DMA (0.5 mL), and $H_2O$ (2.5 mL) was stirred at room temperature for 15 min, then sealed in a 10 mL Teflonlined stainless steel vessel, and heated at 100 °C for 3 days, followed by cooling to room temperature at a rate of 10 °C·$h^{-1}$. Colourless block-shaped crystals of **3** were obtained, washed with distilled water, and dried (yield 61.3% based on $Zn(NO_3)_2\cdot 6H_2O$). Anal. Calcd for $C_{64}H_{46}N_{10}O_{14}Zn_2$: C, 58.68; H, 3.54; N, 10.69. Found: C, 58.82; H, 3.55; N, 10.72%. IR (KBr, $cm^{-1}$): 3197 m, 2982 m, 1752 w, 1701 s, 1585 s, 1553 s, 1507 s, 1420 s, 1390 s, 1303 w, 1259 w, 1212 w, 1179 w, 1153 w, 1004 w, 858 w, 830 w, 762 w, 727 w, 693 w, 671 w, 494 w.

**Synthesis of $\{[Co_3(BIBP)_3(L)_2(H_2O)_2]\cdot 5H_2O\}_n$ (4)**

A mixture of $Co(NO_3)_2\cdot 6H_2O$ (14.6 mg, 0.05 mmol), $H_3L$ (14.4 mg, 0.05 mmol), BIBP (12.8 mg, 0.05 mmol), DMF (1.5 mL), and $H_2O$ (1.5 mL) was stirred at room temperature for 15 min, then sealed in a 10 mL Teflonlined stainless steel vessel, and heated at 100 °C for 3 days, followed by cooling to room temperature at a rate of 10 °C·$h^{-1}$. Red block-shaped crystals of **4** were obtained, washed with distilled water, and dried (yield 64.4 % based on $Co(NO_3)_2\cdot 6H_2O$). Anal. Calcd for $C_{82}H_{68}Co_3N_{14}O_{19}$: C, 56.92; H, 3.96; N, 11.33. Found: C, 57.01; H, 3.97; N, 11.36%. IR (KBr, $cm^{-1}$): 3456 m, 3122m, 1652 w, 1613 s, 1584 s, 1567 s, 1515 s, 1429 m, 1395 s, 1306 m, 1299 s, 1115 s, 1106 s, 1083 w, 1028 w, 1005 w, 932 w, 876 w, 799 s, 746 w, 705 w, 691 w, 651 w, 557 w, 454 w.

### X-ray crystallography

The single-crystal X-ray diffraction datas were collected on a Bruker SMART APEX diffractometer with graphite-monochromatized Mo-*Kα* radiation (λ = 0.71073 Å) by using an ω-scan technique. Empirical absorption corrections and Lorentz polarization are applied. Those structures are solved by direct methods with SHELXS-2014 and refined using full-matrix least-squares procedure on $F^2$ by using the package of SHELXTL-2014. All the hydrogen atoms are generated geometrically and refined isotropically using a riding model. All non-hydrogen atoms are refined with anisotropic displacement parameters. For **3** and **4**, the water molecules were highly disordered, and thus squeeze

refinement has been performed using the SQUEEZE routine of PLATON. The crystallographic data for **1**-**4** are listed in Table S1. Selected bond distances and angles in 1-4 are given in Table S2. CCDC numbers: 1991806 for 1, 1991807 for 2, 1991808 for 3 and 1991809 for 4, respectively.

**Table S1** Crystal data and structure refinement parameters of **1–4**

| CP | **1** | **2** | **3** | **4** |
|---|---|---|---|---|
| Formula | $C_{34}H_{27}N_5O_7Zn$ | $C_{34}H_{27}CoN_5O_7$ | $C_{64}H_{46}N_{10}O_{14}Zn_2$ | $C_{82}H_{68}Co_3N_{14}O_{19}$ |
| Formula weight | 683.00 | 676.54 | 1309.93 | 1730.30 |
| Crystal system | Monoclinic | Monoclinic | Orthorhombic | Orthorhombic |
| Space group | $P2_1/c$ | $P2_1/c$ | $Pnn2$ | $Pcnn$ |
| $a$ (Å) | 15.679(9) | 16.564(7) | 13.8693(10) | 24.357(2) |
| $b$ (Å) | 11.030(6) | 17.185(7) | 50.702(4) | 16.6019(16) |
| $c$ (Å) | 18.158(11) | 10.620(5) | 8.3094(6) | 18.5781(19) |
| $\alpha$ (°) | 90 | 90 | 90 | 90 |
| $\beta$ (°) | 102.581(17) | 92.819(16) | 90 | 90 |
| $\gamma$ (°) | 90 | 90 | 90 | 90 |
| $V$(Å$^3$) | 3065(3) | 3019(2) | 5843.2(8) | 7512.5(12) |
| $Z$ | 4 | 4 | 4 | 4 |
| $D_{calcd}$ (Mg/m$^3$) | 1.480 | 1.488 | 1.469 | 1.450 |
| $\mu$(mm$^{-1}$) | 0.861 | 0.628 | 0.897 | 0.733 |
| Temperature (K) | 293(2) | 293(2) | 293(2) | 293(2) |
| $F$(000) | 1408 | 1396 | 2647 | 3404 |
| $R_{int}$ | 0.0758 | 0.0286 | 0.0892 | 0.0959 |
| $R_1$ [$I > 2\sigma(I)$][a] | 0.0519 | 0.0458 | 0.0625 | 0.0467 |
| $wR_2$ [$I > 2\sigma(I)$][b] | 0.1007 | 0.1269 | 0.1187 | 0.0766 |
| Gof | 0.999 | 0.977 | 1.040 | 1.164 |

$R_1 = \Sigma| |F_o|-|F_c| |/\Sigma|F_o|$. $\omega R_2 = \Sigma[w(F_o^2-F_c^2)^2]/\Sigma[w(F_o^2)^2]^{1/2}$

**Table S2** Selected bond lengths (Å) and angles (°) for **1–4**

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| CP **1** | | | | | | | |
| Zn(1)-O(1) | 1.936(2) | Zn(1)-N(2) | 1.984(3) | Zn(1)-O(5)$^{\#1}$ | 2.020(2) | Zn(1)-N(5)$^{\#2}$ | 2.021(3) |
| O(1)-Zn(1)-N(2) | 122.55(10) | O(1)-Zn(1)-O(5)$^{\#1}$ | 117.96(10) | O(1)-Zn(1)-N(5)$^{\#2}$ | 99.17(11) | N(2)-Zn(1)-O(5)$^{\#1}$ | 100.96(10) |
| N(2)-Zn(1)-N(5)$^{\#2}$ | 113.66(11) | O(5)$^{\#1}$-Zn(1)-N(5)$^{\#2}$ | 100.99(10) | | | | |
| Symmetry codes: #1 -x+2, y+1/2, -z+1/2; #2 x+1, y, z. | | | | | | | |
| CP **2** | | | | | | | |
| Co(1)-O(1) | 2.0626(19) | Co(1)-O(5) | 2.143(2) | Co(1)-N(1) | 2.075(2) | Co(1)-O(6)$^{\#2}$ | 2.197(2) |
| Co(1)-O(7)$^{\#2}$ | 2.155(2) | Co(1)-N(4)$^{\#1}$ | 2.121(2) | | | | |
| O(1)-Co(1)-O(5) | 93.92(8) | O(1)-Co(1)-N(1) | 96.80(9) | N(1)-Co(1)-O(5) | 85.76(10) | O(1)-Co(1)-O(6)$^{\#2}$ | 153.56(8) |
| O(1)-Co(1)-O(7)$^{\#2}$ | 93.29(8) | O(1)-Co(1)-N(4)$^{\#1}$ | 93.10(8) | O(5)-Co(1)-O(6)$^{\#2}$ | 88.25(8) | O(5)-Co(1)-O(7)$^{\#2}$ | 92.45(9) |
| N(1)-Co(1)-O(6)$^{\#2}$ | 109.64(8) | N(1)-Co(1)-O(7)$^{\#2}$ | 169.85(8) | N(1)-Co(1)-N(4)$^{\#1}$ | 92.24(9) | N(4)$^{\#1}$-Co(1)-O(5) | 172.88(9) |
| N(4)$^{\#1}$-Co(1)-O(6)$^{\#2}$ | 85.99(8) | O(7)$^{\#2}$-Co(1)-O(6)$^{\#2}$ | 60.28(7) | N(4)$^{\#1}$-Co(1)-O(7)$^{\#2}$ | 88.32(9) | | |
| Symmetry codes: #1 x+1, -y+3/2, z-1/2; #2 x, y, z-1. | | | | | | | |
| CP **3** | | | | | | | |
| Zn(1)-O(1) | 1.931(5) | Zn(1)-N(3) | 1.975(6) | Zn(1)-N(7) | 2.016(7) | Zn(1)-O(6)$^{\#1}$ | 1.938(5) |
| Zn(2)-O(7) | 1.946(5) | Zn(2)-N(6) | 1.974(6) | Zn(2)-O(7)$^{\#2}$ | 1.946(5) | Zn(2)-N(6)$^{\#2}$ | 1.974(6) |
| Zn(3)-N(10) | 2.038(6) | Zn(3)-N(10)$^{\#3}$ | 2.038(7) | Zn(3)-O(9)$^{\#1}$ | 2.373(6) | Zn(3)-O(9)$^{\#4}$ | 2.373(6) |
| Zn(3)-O(10)$^{\#1}$ | 2.081(6) | Zn(3)-O(10)$^{\#4}$ | 2.081(6) | | | | |
| O(1)-Zn(1)-N(3) | 116.1(3) | O(1)-Zn(1)-N(7) | 101.2(3) | N(3)-Zn(1)-N(7) | 110.1(3) | O(1)-Zn(1)-O(6)$^{\#1}$ | 111.3(3) |
| O(6)$^{\#1}$-Zn(1)-N(3) | 113.4(3) | O(6)$^{\#1}$-Zn(1)-N(7) | 103.3(3) | O(7)-Zn(2)-N(6) | 105.0(3) | O(7)-Zn(2)-N(6)$^{\#2}$ | 116.2(3) |
| N(6)-Zn(2)-N(6)$^{\#2}$ | 115.9(5) | O(7)$^{\#2}$-Zn(2)-O(7) | 97.4(4) | O(7)$^{\#2}$-Zn(2)-N(6) | 116.2(3) | O(7)$^{\#2}$-Zn(2)-N(6)$^{\#2}$ | 105.0(3) |
| N(10)-Zn(3)-O(9)$^{\#1}$ | 96.3(3) | N(10)-Zn(3)-O(10)$^{\#1}$ | 110.0(3) | N(10)-Zn(3)-O(9)$^{\#4}$ | 148.0(3) | N(10)-Zn(3)-O(10)$^{\#4}$ | 90.8(3) |
| N(10)-Zn(3)-N(10)$^{\#3}$ | 98.8(4) | N(10)-Zn(3)-O(10)$^{\#1}$ | 90.8(3) | N(10)$^{\#3}$-Zn(3)-O(9)$^{\#1}$ | 148.0(3) | N(10)$^{\#3}$-Zn(3)-O(9)$^{\#4}$ | 96.3(3) |
| N(10)$^{\#3}$-Zn(3)-O(10)$^{\#4}$ | 110.0(3) | O(9)$^{\#4}$-Zn(3)-O(9)$^{\#1}$ | 85.2(4) | O(10)$^{\#1}$-Zn(3)-O(9)$^{\#1}$ | 57.4(3) | O(10)$^{\#1}$-Zn(3)-O(9)$^{\#4}$ | 97.8(3) |
| O(10)$^{\#4}$-Zn(3)-O(9)$^{\#1}$ | 97.8(3) | O(10)$^{\#4}$-Zn(3)-O(9)$^{\#4}$ | 57.4(3) | O(10)$^{\#4}$-Zn(3)-O(10)$^{\#1}$ | 148.2(5) | | |
| Symmetry codes: #1 x-1/2, -y+3/2, z-1/2; #2 -x+2, -y+1, z; #3 -x, -y+2, z; #4 -x+1/2, y+1/2, z-1/2. | | | | | | | |
| CP **4** | | | | | | | |
| Co(1)-O(1) | 2.0324(18) | Co(1)-O(7) | 2.176(2) | Co(1)-N(2) | 2.123(2) | Co(1)-O(3)$^{\#2}$ | 2.2306(19) |
| Co(1)-O(4)$^{\#2}$ | 2.1530(18) | Co(1)-N(7)$^{\#1}$ | 2.078(2) | Co(2)-O(6) | 1.975(2) | Co(2)-N(4) | 2.036(2) |
| Co(2)-O(6)$^{\#3}$ | 1.975(2) | Co(2)-N(4)$^{\#3}$ | 2.036(2) | | | | |
| O(1)-Co(1)-N(2) | 88.43(10) | O(1)-Co(1)-O(7) | 85.02(10) | N(2)-Co(1)-O(7) | 170.51(10) | O(1)-Co(1)-O(3)$^{\#2}$ | 90.72(9) |
| O(1)-Co(1)-O(4)$^{\#2}$ | 147.86(9) | O(1)-Co(1)-N(7)$^{\#1}$ | 104.39(10) | N(2)-Co(1)-O(4)$^{\#2}$ | 101.70(10) | O(4)$^{\#2}$-Co(1)-O(7) | 80.56(10) |
| N(7)$^{\#1}$-Co(1)-O(7) | 92.19(11) | N(7)$^{\#1}$-Co(1)-N(2) | 96.10(10) | N(7)$^{\#1}$-Co(1)-O(4)$^{\#2}$ | 104.73(9) | O(6)-Co(2)-N(4) | 102.14(11) |
| N(2)-Co(1)-O(3)$^{\#2}$ | 87.38(10) | N(4)-Co(2)-N(4)$^{\#3}$ | 110.56(17) | O(7)-Co(1)-O(3)$^{\#2}$ | 85.83(10) | O(6)-Co(2)-N(4)$^{\#3}$ | 97.63(11) |
| O(6)$^{\#3}$-Co(2)-O(6) | 144.94(16) | O(6)$^{\#3}$-Co(2)-N(4) | 97.64(11) | O(4)$^{\#2}$-Co(1)-O(3)$^{\#2}$ | 59.83(8) | O(6)$^{\#3}$-Co(2)-N(4)$^{\#3}$ | 102.14(11) |
| N(7)$^{\#1}$-Co(1)-O(3)$^{\#2}$ | 164.55(9) | | | | | | |
| Symmetry codes: #1 x-1, y, z; #2 -x, y-1/2, -z+1/2; #3 -x+1/2, -y+3/2, z. | | | | | | | |

**Table S3** Hydrogen bonds in **1**

| D-H···A | d(H···A)/Å | d(D···A)/Å | ∠(D–H···A)/° |
|---|---|---|---|
| O3-H3···O6 | 1.78 | 2.580(3) | 165 |
| O7-H7A···O2 | 1.97 | 2.819(4) | 176 |
| O7-H7B···O6 | 2.36 | 3.204(5) | 177 |
| C13-H13···O4 | 2.53 | 3.350(5) | 147 |
| C34-H34···O7 | 2.49 | 3.418(5) | 174 |

**Table S4** Hydrogen bonds in **2**

| D-H···A | d(H···A)/Å | d(D···A)/Å | ∠(D–H···A)/° |
|---|---|---|---|
| O3-H3A···O2 | 1.74 | 2.537(3) | 164 |
| C2-H2···O6 | 2.30 | 3.066(4) | 139 |
| C23-H23···O3 | 2.35 | 3.195(3) | 152 |
| C32-H32···O7 | 2.49 | 3.217(4) | 135 |
| C33-H33···N5 | 2.56 | 3.282(4) | 135 |

**Table S5** Hydrogen bonds in **4**

| D-H···A | d(H···A)/Å | d(D···A)/Å | ∠(D–H···A)/° |
|---|---|---|---|
| O7-H7A···O5 | 2.14 | 2.684(3) | 121 |

**Table S6** Standard deviation and detection limit calculation for $Fe^{3+}$, $Cr_2O_7^{2-}$, $CrO_4^{2-}$, NZF and NFT in **1**

| | $Fe^{3+}$ | $Cr_2O_7^{2-}$ | $CrO_4^{2-}$ | NZF | NFT |
|---|---|---|---|---|---|
| 1 | 728.563939 | 724.101922 | 733.929807 | 705.063327 | 710.341816 |
| 2 | 728.513331 | 724.281137 | 733.671266 | 705.192321 | 710.471122 |
| 3 | 728.621442 | 724.321129 | 733.781232 | 705.217783 | 710.178877 |
| 4 | 728.312735 | 724.511788 | 734.021804 | 704.811117 | 710.571633 |
| 5 | 728.171232 | 724.016677 | 733.621255 | 705.322185 | 710.143327 |
| Standard deviation (σ) | 0.16854 | 0.17371 | 0.15152 | 0.17566 | 0.16461 |
| Ksv | $2.21\times10^{4}$ | $2.08\times10^{4}$ | $1.70\times10^{4}$ | $7.07\times10^{4}$ | $8.64\times10^{4}$ |
| Detection limit (3σ/Ksv) | $2.29\times10^{-5}$ | $2.51\times10^{-5}$ | $2.67\times10^{-5}$ | $7.45\times10^{-6}$ | $5.71\times10^{-6}$ |

**Table S7** Standard deviation and detection limit calculation for $Fe^{3+}$, $Cr_2O_7^{2-}$, $CrO_4^{2-}$, NZF and NFT in **3**

| | $Fe^{3+}$ | $Cr_2O_7^{2-}$ | $CrO_4^{2-}$ | NZF | NFT |
|---|---|---|---|---|---|
| 1 | 775.889117 | 775.889116 | 769.297499 | 786.034396 | 797.243294 |
| 2 | 775.728337 | 775.658753 | 769.426311 | 786.012132 | 797.411632 |
| 3 | 775.973369 | 775.985421 | 769.065532 | 786.215521 | 797.091573 |
| 4 | 775.532251 | 775.696323 | 769.482113 | 786.352132 | 797.437743 |
| 5 | 775.626524 | 775.587821 | 769.530309 | 785.891242 | 797.521368 |
| Standard deviation (σ) | 0.16271 | 0.14925 | 0.16669 | 0.16281 | 0.15404 |
| Ksv | $1.47\times10^{4}$ | $1.34\times10^{4}$ | $1.20\times10^{4}$ | $2.00\times10^{4}$ | $3.87\times10^{4}$ |
| Detection limit (3σ/Ksv) | $3.32\times10^{-5}$ | $3.34\times10^{-5}$ | $4.16\times10^{-5}$ | $2.44\times10^{-5}$ | $1.19\times10^{-5}$ |

**Table S8** Comparison of various CPs sensors for the detection of $Fe^{3+}$, $Cr_2O_7^{2-}$ and $CrO_4^{2-}$ ions

| | Analyte | CPs-based fluorescent Materials | Quenching constant ($K_{SV}$, $M^{-1}$) | Detection Limits (DL) | Media | Ref |
|---|---|---|---|---|---|---|
| 1 | $Fe^{3+}$ | $[H_2N(CH_3)_2]_2[Zn_2L(HPO_3)_2]$ | $3.96 \times 10^5$ | $1.16 \times 10^{-4}$ mM | $H_2O$ | 36 |
| 2 | | $\{[Tb(Cmdcp)(H_2O)_3]_2(NO_3)_2 \cdot 5H_2O\}_n$ | 5532 | 1.5 mM | $H_2O$ | 37 |
| 3 | | $\{[Cu^I_2(ttpa)2][Cu^{II}(bptc)] \cdot 3H_2O \cdot DMF\}_n$ | $3.817 \times 10^3$ | 2.59 μM | $H_2O$ | 38 |
| 4 | | $\{[Co_4(timb)_2(Br–IPA)_4] \cdot 5H_2O\}_n$ | $1.79 \times 10^4$ | $3.01 \times 10^{-5}$ M | $H_2O$ | 39 |
| 5 | | $[Tb(HMDIA)(H_2O)_3] \cdot H_2O$ | $1.73 \times 10^4$ | | $H_2O$ | 40 |
| | | | | | | |
| 1 | $Cr_2O_7^{2-}$ | $[Cd_2(L_1)(1,4\text{-}NDC)_2]_n$ | $5.86 \times 10^4$ | 0.031 ppm | $H_2O$ | 41 |
| 2 | | $[Zr_6O_4(OH)_8(H_2O)_4(TCPP)_4]$ □9DMF□3.5$H_2O$ | $5.91 \times 10^4$ | | $H_2O$ | 42 |
| 3 | | $\{[Zn(H_2BCA)(m\text{-}bib)] \cdot H_2O\}_n$ | $5.3 \times 10^4$ | 0.07 μM | $H_2O$ | 43 |
| 4 | | $[Zn_5(TDA)_4(TZ)_4] \cdot 4DMF\}_n$ | $6.77 \times 10^3$ | | $H_2O$ | 44 |
| 5 | | $[Zn(NH_2\text{-}bdc)(4,4'\text{-}bpy)]$ | $7.62 \times 10^3$ | 1.30 μM | $H_2O$ | 45 |
| 6 | | $[Cd_{1.5}(L)_2(bpy)(NO_3)] \cdot 2DMF \cdot 2H_2O$ | $5.42 \times 10^4$ | 320 ppb | $H_2O$ | 46 |
| | | | | | | |
| 1 | $CrO_4^{2-}$ | $[Cd_{1.5}(L)_2(bpy)(NO_3)] \cdot 2DMF \cdot 2H_2O$ | $1.73 \times 10^4$ | 280 ppb | $H_2O$ | 46 |
| 2 | | $[Zn_2(TPOM)(NDC)_2] \cdot 3.5H_2O$ | $7.81 \times 10^3$ | 2.50 μM | $H_2O$ | 47 |
| 3 | | $\{[Zn(L)_{0.5}(bimb)] \cdot 2H_2O \cdot 0.5(CH_3)_2NH\}_n$ | $5.04 \times 10^4$ | 0.60 μM | $H_2O$ | 48 |
| 4 | | $[Ni(ppvppa)(5\text{-}NO_2\text{-}1,3\text{-}BDC)(H_2O)] \cdot 0.5MeCN$ | 210526 | 0.09 ppb | $H_2O$ | 49 |
| 5 | | $\{[Cd_2L_2(H_2O)_4] \cdot H_2O\}_n$ | $1.21 \times 10^4$ | 3.8 μM | $H_2O$ | 50 |
| 6 | | $\{[Zn_2L_2(H_2O)_4] \cdot H_2O\}_n$ | $1.95 \times 10^4$ | 2.3 μM | | |
| 7 | | | $1.18 \times 10^4$ | $2.54 \times 10^{-4}$ | $H_2O$ | 51 |

$H_3$CmdcpBr = N-carboxymethyl-(3,5-dicarboxyl)pyridinium bromide;

ttpa = tris(4-(1,2,4-triazol-1-yl)phenyl)amine, $H_4$bptc = 3,3′,4,4′-biphenyltetracarboxylic acid;

timb=1,3,5-tris(2-methylimidazol-1-yl)benzene;

$H_4$MDIA= 5,5′-methylenediisophthalic acid;

L1 = 1,4-bis(benzimidazol-1-yl)-2-butylene, 1,4-$H_2$NDC = 1,4-naphthalenedicarboxylic acid;

$H_4$TCPP=2,3,5,6-tetrakis(4-carboxyphenyl)pyrazine;

$H_2$BCA= bis(4-carboxybenzyl)amine, m-bib = 1,3-bis(1-imidazoly)benzene;

$H_2$TDA = thiophene-2,5-dicarboxylic acid, HTZ = 1H-1,2,4-Triazole;

$NH_2$-$H_2$bdc = 2-amino-1,4-benzenedicarboxylic acid, 4,4'-bpy = 4,4'-bipyridine;

HL = 4-(4-carboxyphenyl)-1,2,4-triazole, bpy = 4,4′-bipyridine;

TPOM = tetrakis(4-pyridyloxymethylene)methane, $H_2$ndc = 2,6-naphthalenedicarboxylic acid;

ppvppa = dipyridin-2-yl-[4-(2-pyridin-4-yl-vinyl)-phenyl]-amine, 5-$NO_2$-1,3-$H_2$BDC = 5-nitroisophthalic acid;

$H_2$L = 5-(1H-1,2,4-triazol-1-yl)isophthalic acid.

**Table S9** Comparison of various CPs sensors for the detection of NZF and NFT

| | Analyte | CPs-based fluorescent Materials | Quenching constant ($K_{SV}$, $M^{-1}$ ) | Detection Limits (DL) | Media | Ref |
|---|---|---|---|---|---|---|
| 1 | NZF | $\{[Cd_3(TDCPB)\cdot 2DMAc]\cdot DMAc\cdot 4H_2O\}_n$ | $7.46 \times 10^4$ | | DMAc | 52 |
| 2 | | $\{[Tb(TATMA)(H_2O)\cdot 2H_2O\}_n$ | $3.00 \times 10^4$ | | $H_2O$ | 53 |
| 3 | | $[Zn(L)_2]\cdot CH_2Cl_2\cdot CH_3OH$ | $1.62 \times 10^4$ | | $CH_3OH$ | 54 |
| 4 | | $[Cd(tptc)_{0.5}(o\text{-}bimb)]_n$ | $4.4 \times 10^4$ | | DMF | 55 |
| 5 | | $[Cd(H_2tptc)_{0.5}(mbimb)(Cl)]_n$ | $2.1 \times 10^5$ | | DMF | |
| 6 | | $[Zn_2(azdc)_2(dpta)]\cdot(DMF)_4$ | $1.30 \times 10^5$ | 0.63 ppm | DMF | 56 |
| | | | | | | |
| 1 | NFT | $\{[Cd_3(TDCPB)\cdot 2DMAc]\cdot DMAc\cdot 4H_2O\}_n$ | $1.05 \times 10^5$ | | DMAc | 52 |
| 2 | | $\{[Tb(TATMA)(H_2O)\cdot 2H_2O\}_n$ | $3.35 \times 10^4$ | | $H_2O$ | 53 |
| 3 | | $[Zn(L)_2]\cdot CH_2Cl_2\cdot CH_3OH$ | $1.58 \times 10^4$ | | $CH_3OH$ | 54 |
| 4 | | $[Cd(tptc)_{0.5}(o\text{-}bimb)]_n$ | $3.4 \times 10^4$ | | DMF | 55 |
| 5 | | $[Cd(H_2tptc)_{0.5}(mbimb)(Cl)]_n$ | $2.6 \times 10^5$ | | DMF | |
| 6 | | $[TbL\cdot 2H_2O]_n$ | $5.26 \times 10^4$ | | $H_2O$ | 57 |
| 7 | | $[Zn_2(azdc)_2(dpta)]\cdot(DMF)_4$ | $7.14 \times 10^4$ | | DMF | 56 |

$H_6$TDCPB = 1,3,5-tris[3,5-bis(3-carboxylphenyl-1-yl)phenyl-1-yl]benzene;

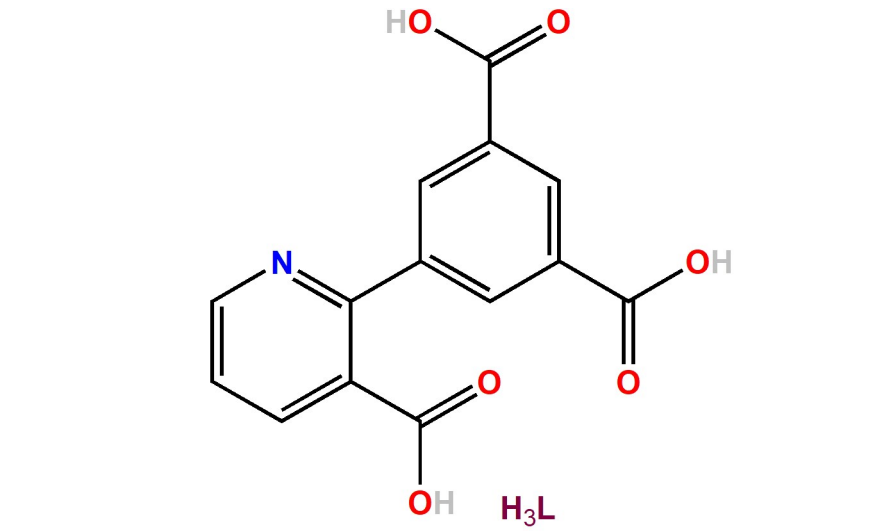
$H_3$TATMA = 4, 4′,4″-s-triazine-1,3,5-triyltri-m-aminobenzoate

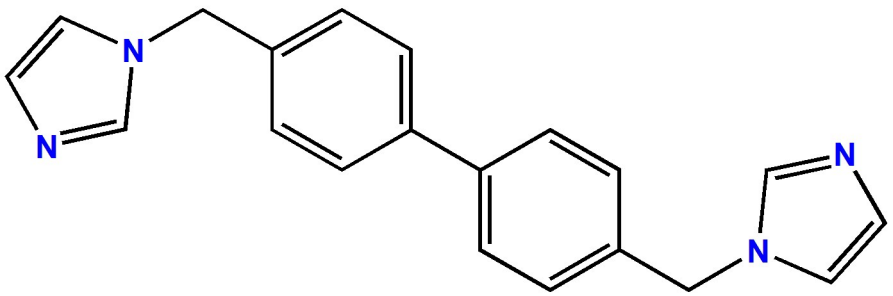
HL = 2-hydroxy-4-(pyridin-4-yl)benzaldehyde

$H_4$tptc = p-terphenyl-2,2″,5″,5″-tetracarboxylate acid

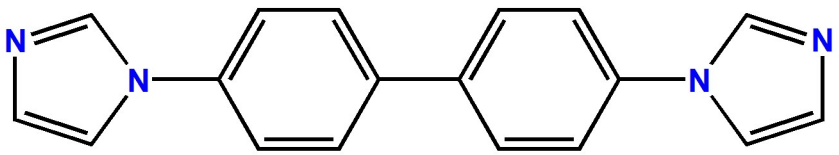
bimb = ortho/meta-bis(imidazol-1-ylmethyl)benzene

$H_2$azdc = Azobenzene-4,4'-dicarboxylic Acid



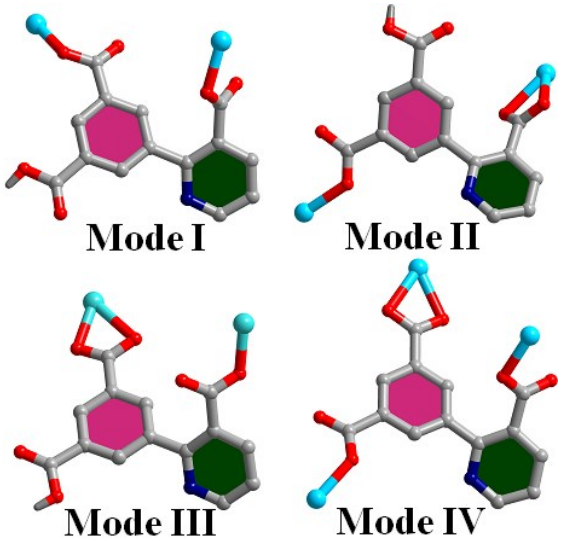




BIMB

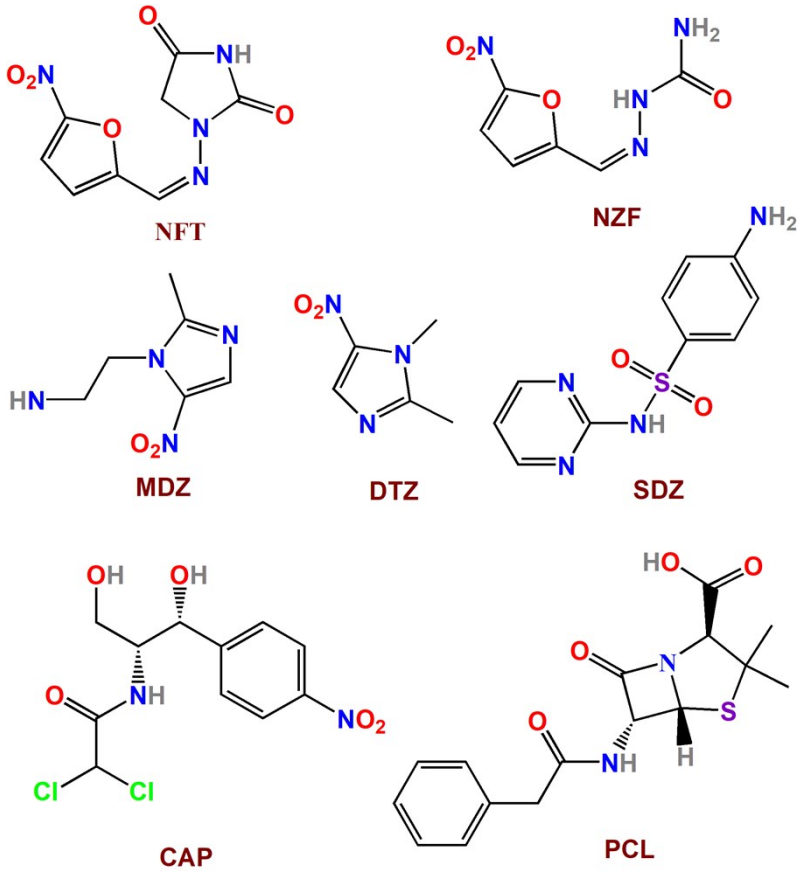



BIBP

**Scheme S1**. Structural characteristics of one pyridinephenyl bifunctional ligand ($H_3L$) and two (bis)imidazole bridging linkers (BIMB and BIBP)




**Scheme S2**. The coordination modes of $H_3L$ in titled CPs.




**Scheme S3**. The structures of selected antibiotics

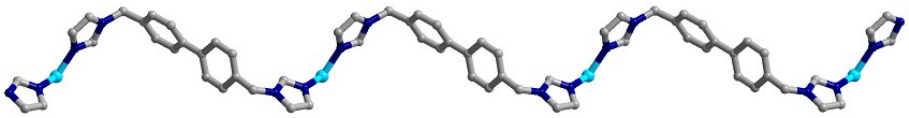


**Fig. S1** The 1D $[Zn(BIMB)]_n$ polymeric chain in **1**

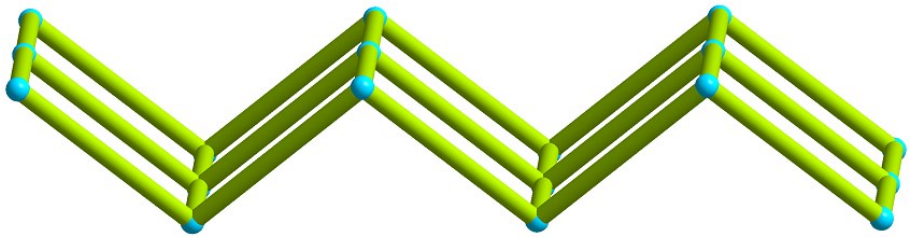


**Fig. S2** The 2D 4-connected **sql** sheet of **1**

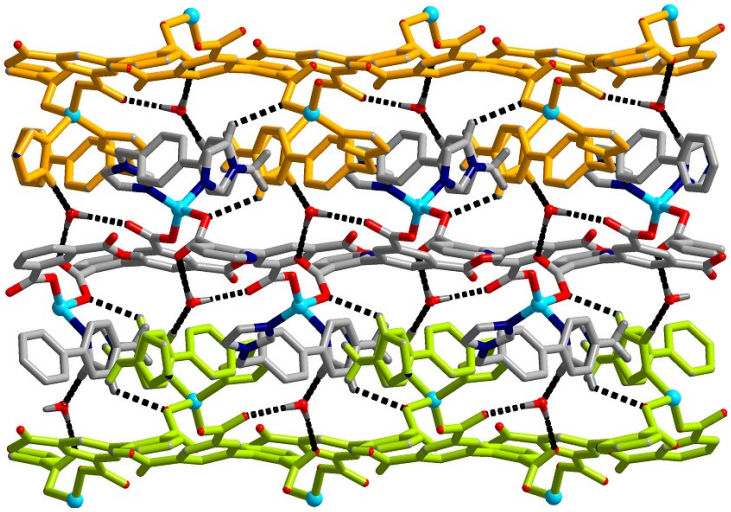


**Fig. S3** The 3D supramolecular structure of **1**

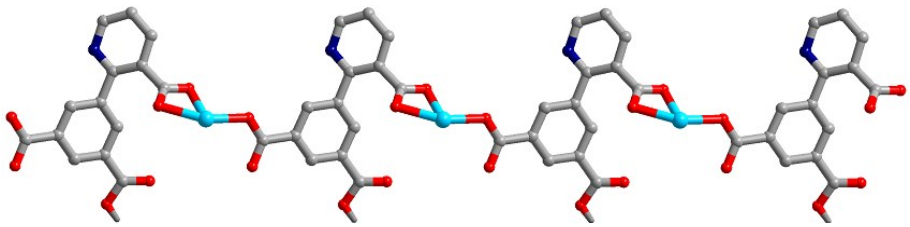


**Fig. S4** The 1D $[Co(HL)]_n$ chain in **2**

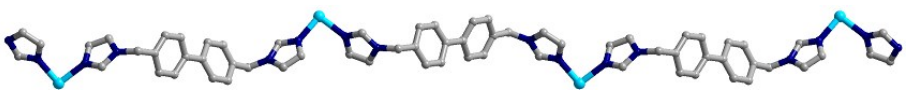


**Fig. S5** The 1D $[Co(BIMB)]_n$ polymeric chain in **2**

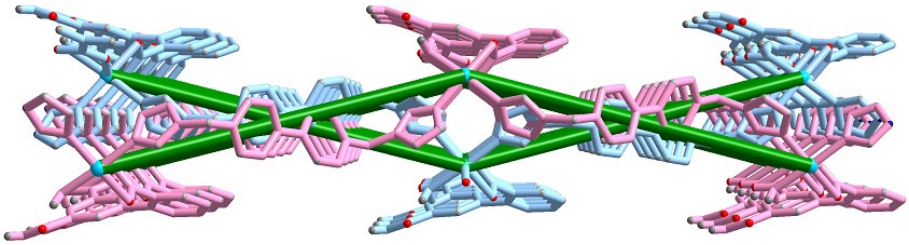


**Fig. S6** The 2D+2D→2D interpenetrating sheets of **2**

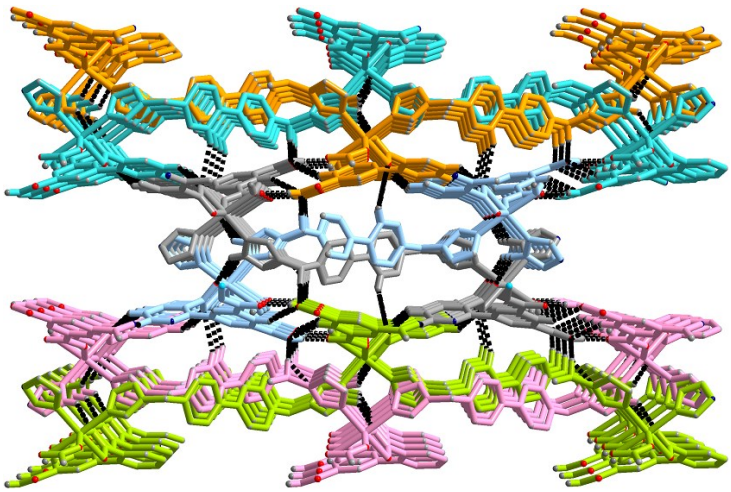


**Fig. S7** The 3D supramolecular structure of **2**

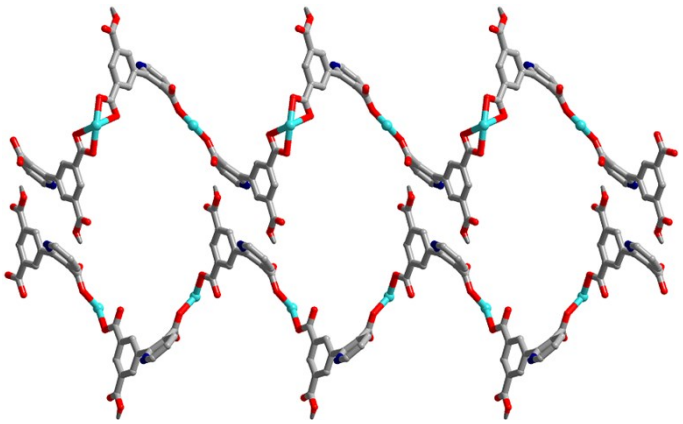


**Fig. S8** Two kinds of 1D $[Zn(HL)]_n$ chains in **3**

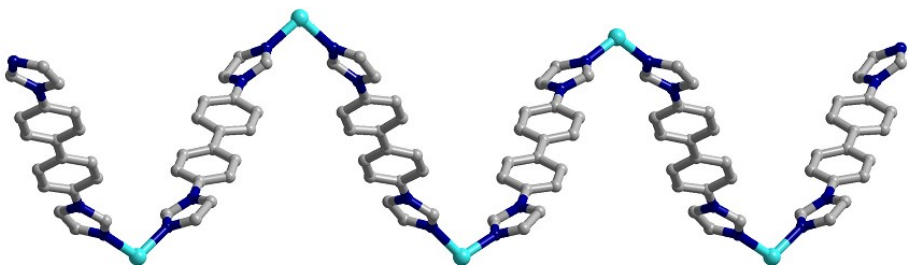


**Fig. S9** The 1D $[Zn(BIBP)]_n$ polymeric chain in **3**

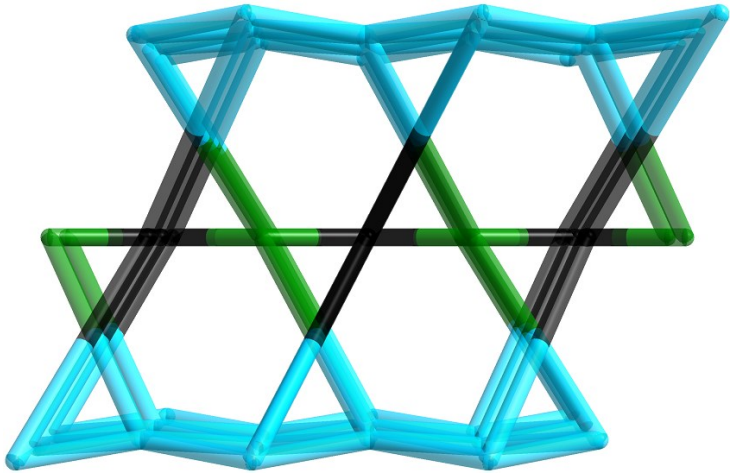


**Fig. S10** The 3D $\{4^2.8^3.10\}$ **tcj** topology of **3**

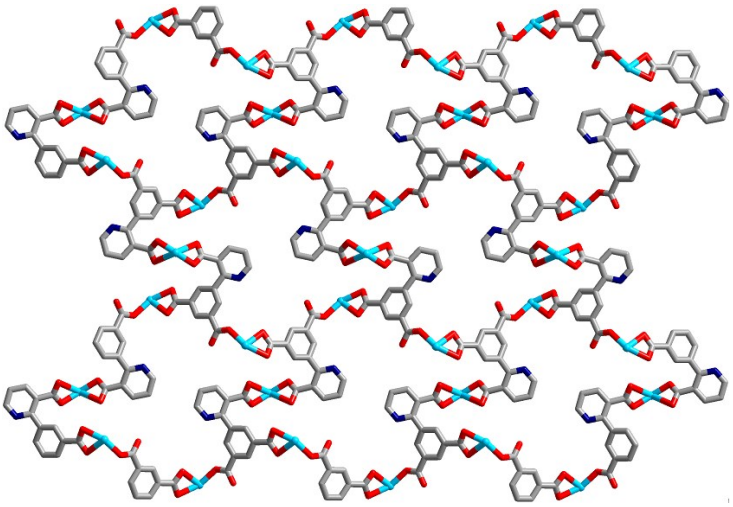


**Fig. S11** The 2D $[Co_3(L)_2]_n$ sheet of **4**

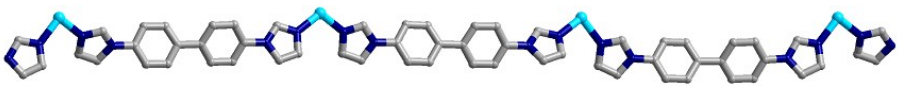


**Fig. S12** The 1D $[Co(BIBP)]_n$ polymeric chain in **4**

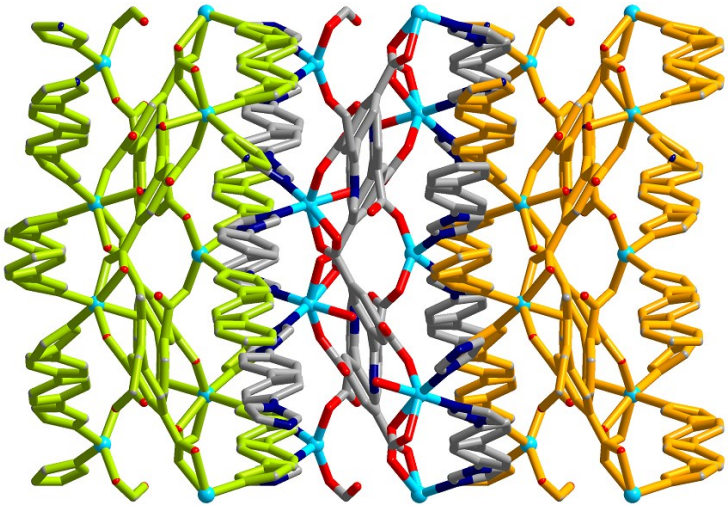


**Fig. S13** The 3D supramolecular structure of **4**

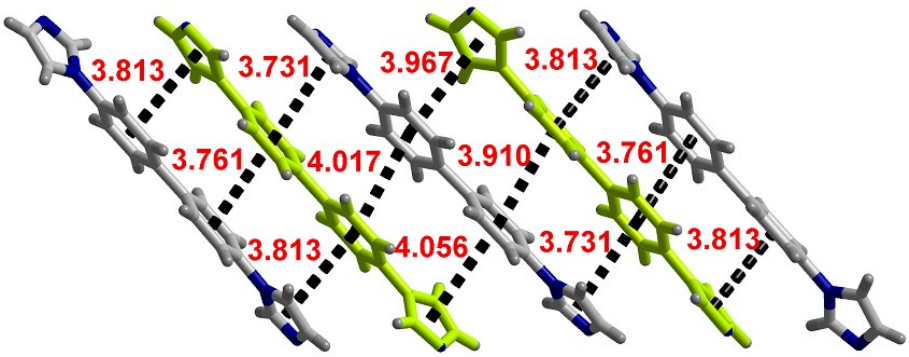



**Fig. S14** The π···π packing interactions among the phenyl rings and the imidazolyl rings in the formation of 3D supramolecular structure of **4**

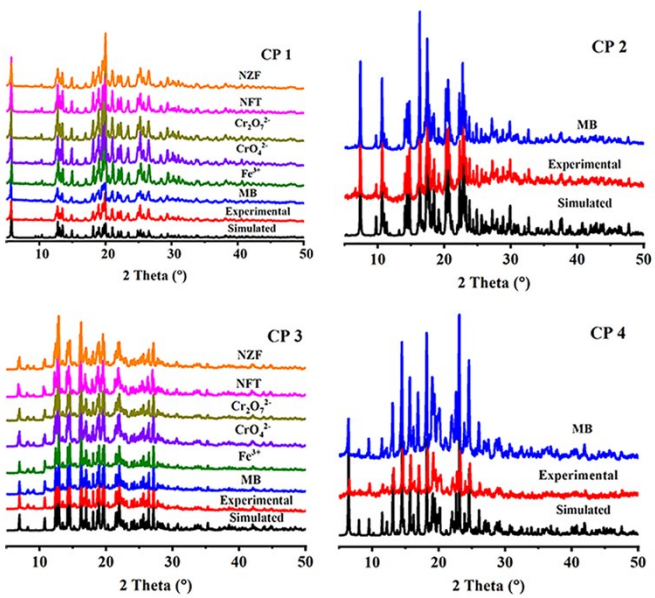



**Fig. S15** PXRD patterns of **1-4**

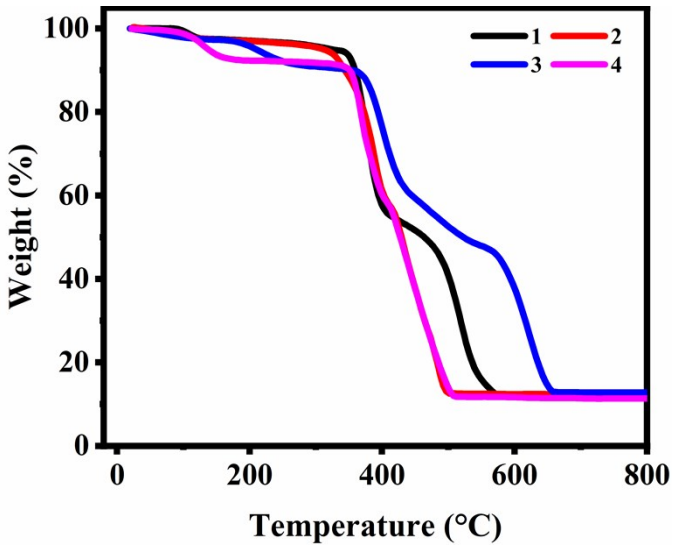



**Fig. S16** TGA curves for **1**−**4**

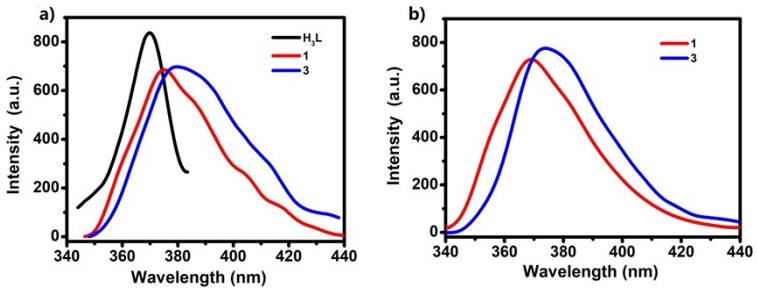



**Fig. S17** The solid state (a) and suspension (b) fluorescence spectra for compounds **1**, **3** and $H_3L$ ligand.

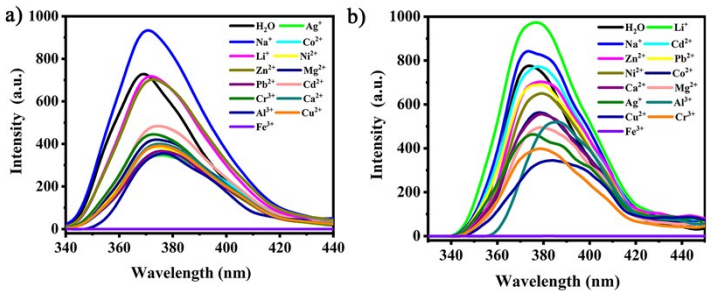



**Fig. S18** Fluorescence response of **1**(a) and **3**(b) toward different metal cations in $H_2O$ solution

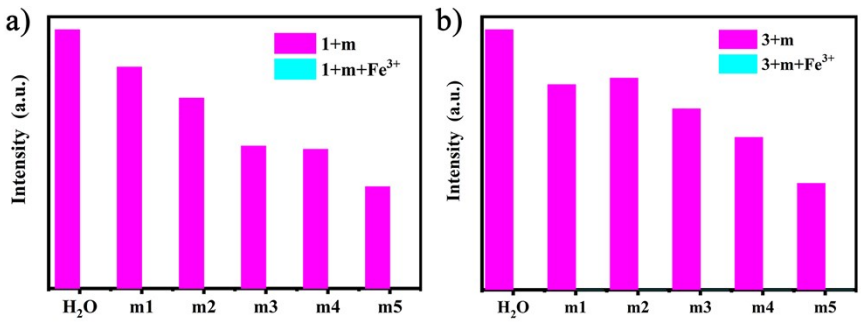



**Fig. S19** Luminescence intensity of **1** (a) and **3** (b) with different mixed cations solution added $Fe^{3+}$ ions ($10^{-2}$ M) (m1: $Ag^{+}/Na^{+}/Co^{2+}$; m2: $Li^{+}/Ni^{2+}/Zn^{2+}$; m3: $Mg^{2+}/Pb^{2+}/Cd^{2+}$; m4: $Cr^{3+}/Ca^{2+}$; m5: $Al^{3+}/Cu^{2+}$).

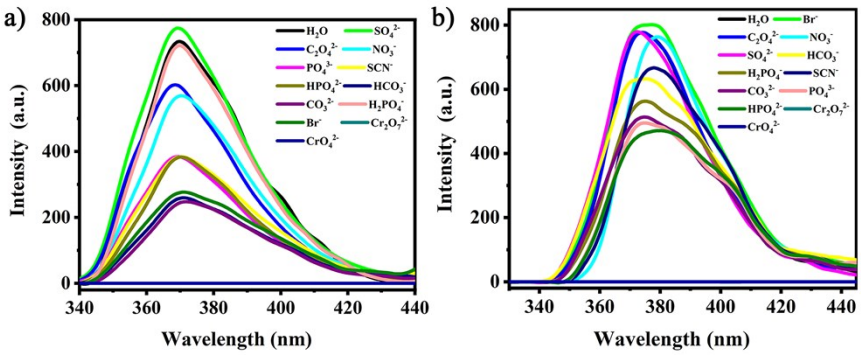



**Fig. S20** Fluorescence response of **1**(a) and **3**(b) toward different anions in $H_2O$ solution

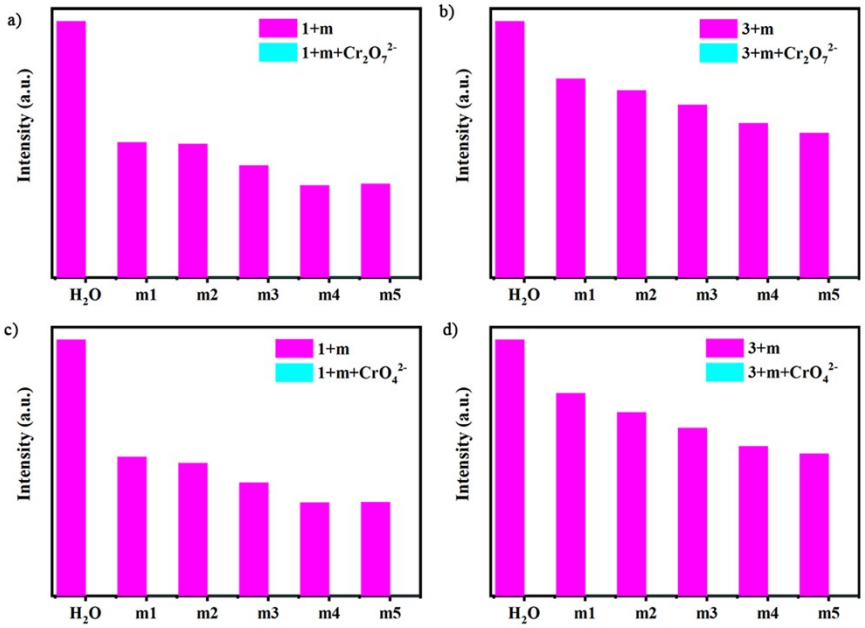



**Fig. S21** Luminescence intensity of **1** (a) and **3** (b) with different mixed cations solution added $Cr_2O_7^{2-}$ ions ($10^{-2}$ M) and **3** (c) and **4** (d) with different mixed cations solution added $CrO_4^{2-}$ ions ($10^{-2}$ M) (m1: $SO_4^{2-}$/$CO_3^{2-}$; m2: $C_2O_4^{2-}$/$PO_4^{3-}$; m3: $H_2PO_4^{-}$/$HPO_4^{2-}$; m4: $Br^-$/$SCN^-$; m5: $NO_3^-$/$HCO_3^-$).

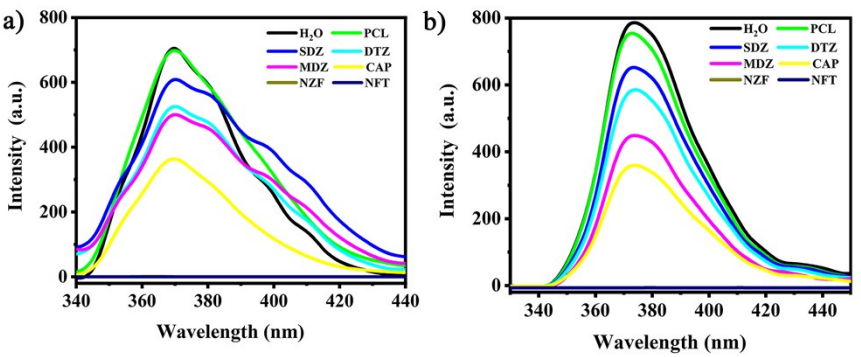



**Fig. S22** Fluorescence response of **1**(a) and **3**(b) toward different antibiotics in $H_2O$ solution

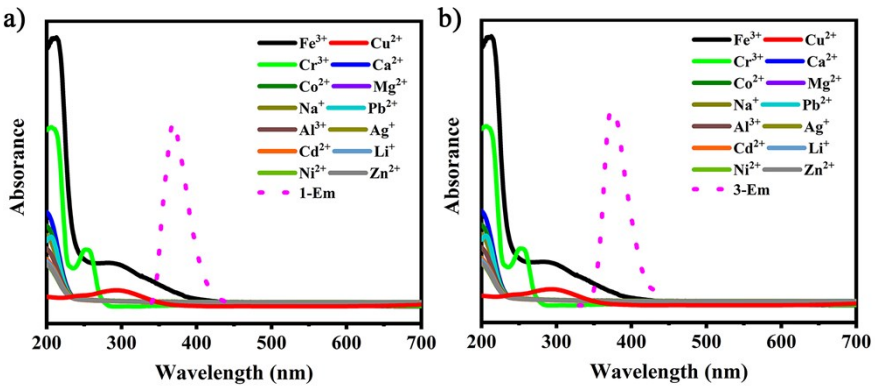



**Fig. S23** UV-vis spectra of different cations in $H_2O$ solutions, and the emission spectra of **1**(a) and **3**(b)

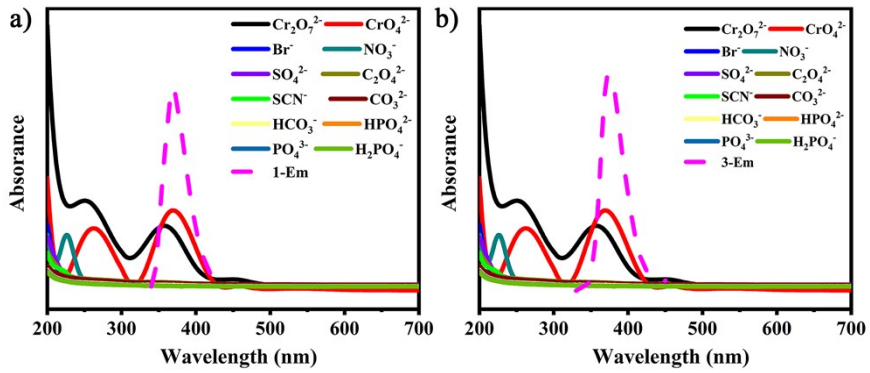



**Fig. S24** UV-vis spectra of different anions in $H_2O$ solutions, and the emission spectra of **1**(a) and **3**(b)

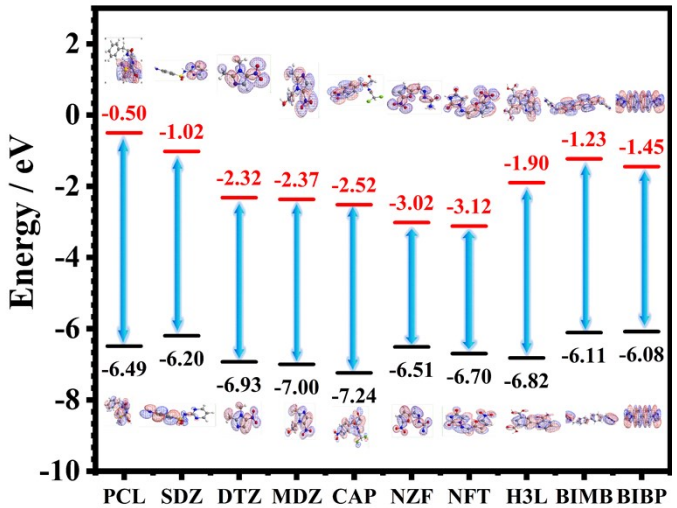



**Fig. S25** The HOMO and LUMO energy levels for different antibiotics and ligands

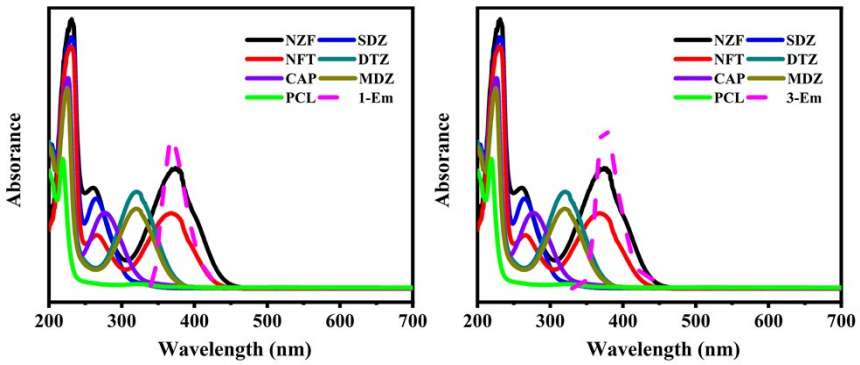



**Fig. S26** UV-vis spectra of different antibiotics in $H_2O$ solutions, and the emission spectra of **1** and **3**

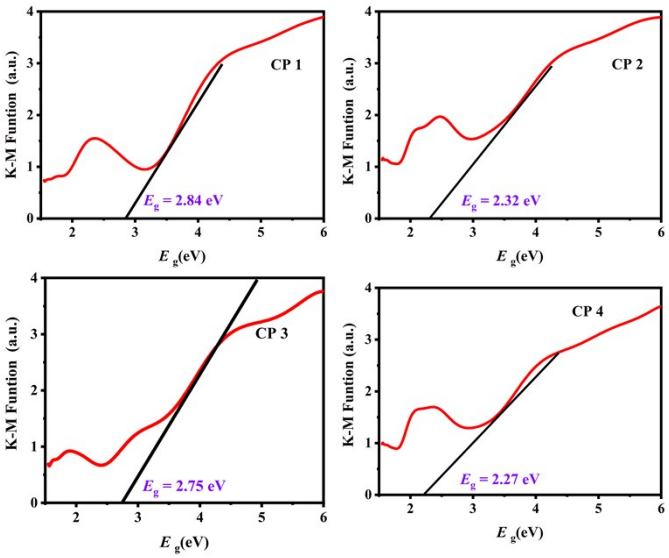



**Fig. S27** Kubelka–Munk-transformed diffuse reflectance spectra of **1-4**