# Supporting Information for

## Four cobalt(II) coordination polymers with diverse topologies derived from flexible bis(benzimidazole) and aromatic dicarboxylic acids：Syntheses, crystal structures and catalytic properties

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**XRPD analysis**

After the catalytic degradation reaction, the resulting mixture was centrifuging, solid samples were washed with deionized water and air-dried. Then the samples were reused to degrade Congo red azo dye for the next process. The X-ray powder diffraction (XRPD) patterns for the complexes **1-4** are presented in (Fig. S3), As-obtained sample for first and second experiment for degradation Congo red are in good agreement with the corresponding simulated from single crystal X-ray data of four coordination polymers, respectively (**1**-4), indicating the phase purities of the complexes samples. So these MOFs stable enough for the degradation Congo red and can be recycled and reused twice(Table. S2).

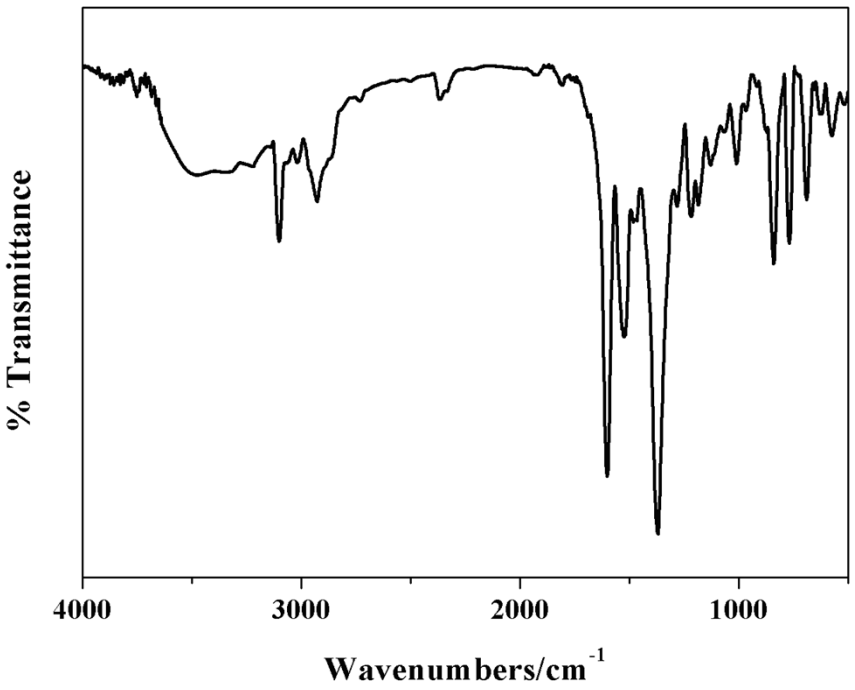
**Fig. S1** The IR spectra for **1**-**4**

**Fig. S2** TG curves for **1**-**4**

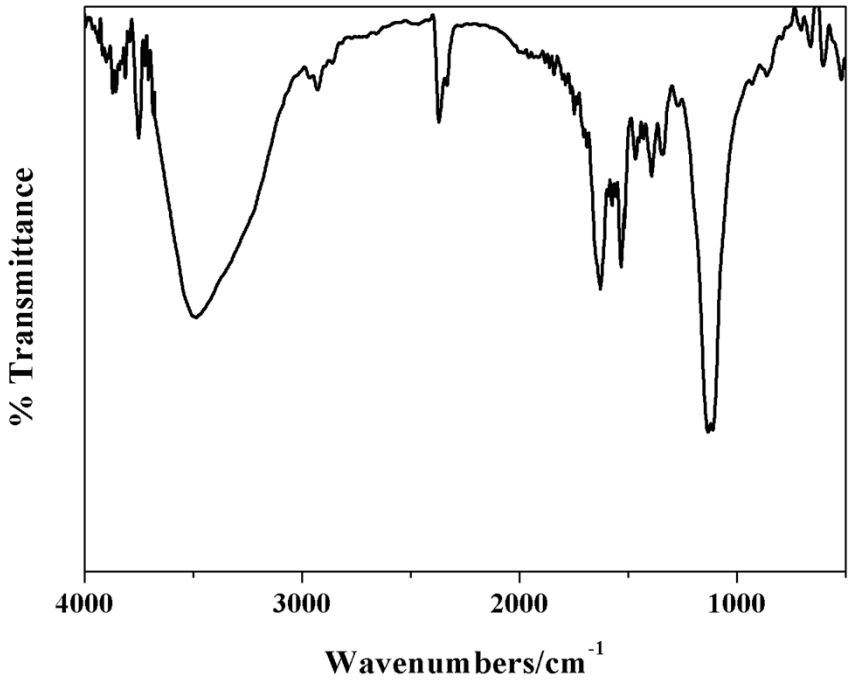
**Fig. S3** X-Ray powder diffraction patterns of **1**-**4,** the as-obtained sample after first(curves a) and second(curves b) experiment for degradation Congo red.

**Table S1** Selected bond lengths (Å) and angles (°) for complexes **1**-**4**

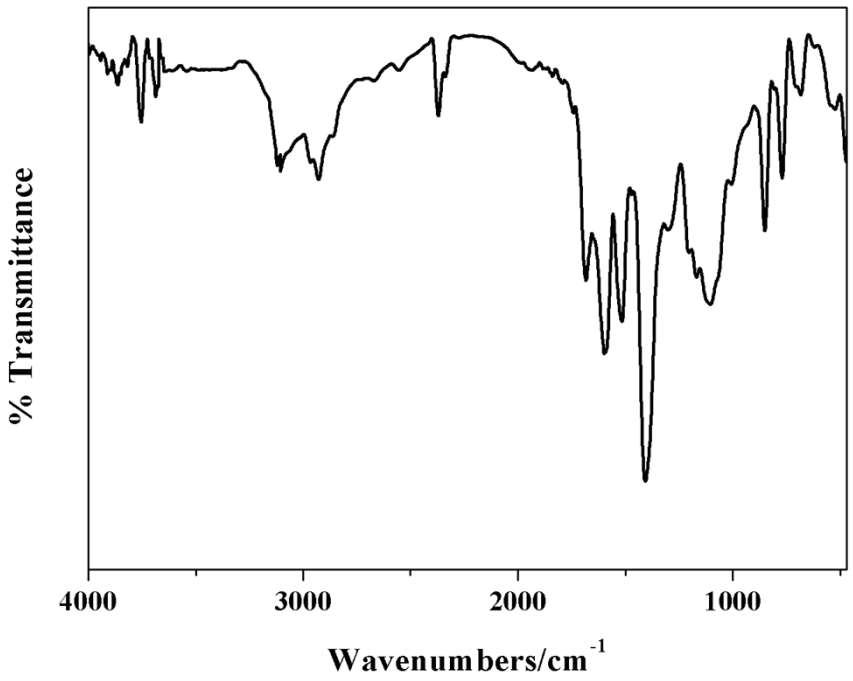
**Table S2** recycled and reused twice experimental results of complexes **1-4** for the degradation Congo red after 130 min


% Transmittance
4000
3000
2000
1000
Wavenumbers/cm-1

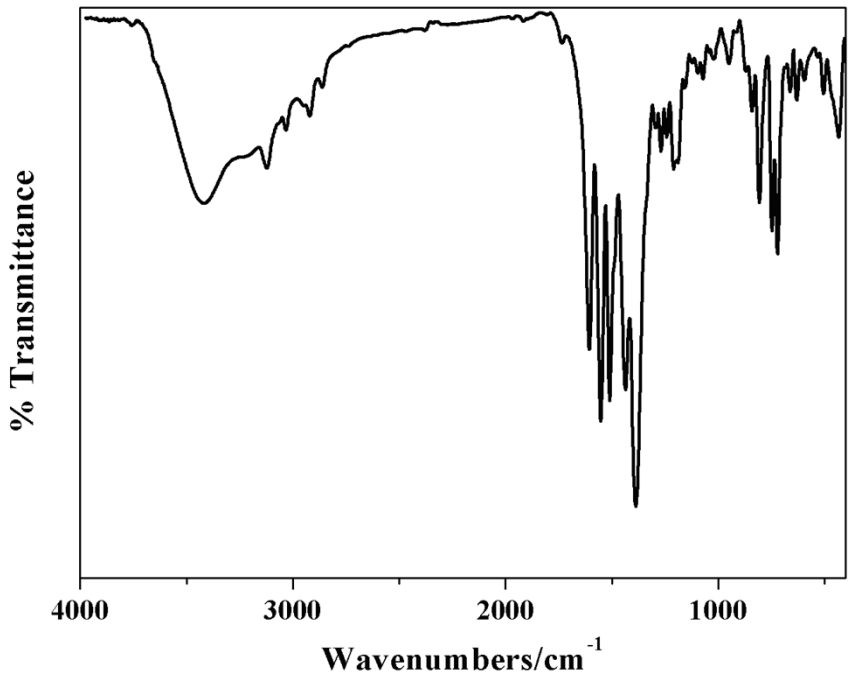
(a)


% Transmittance
4000
3000
2000
1000
Wavenumbers/cm-1

(b)




(c)




(d)

**Fig. S1** The IR spectra for **1-4**

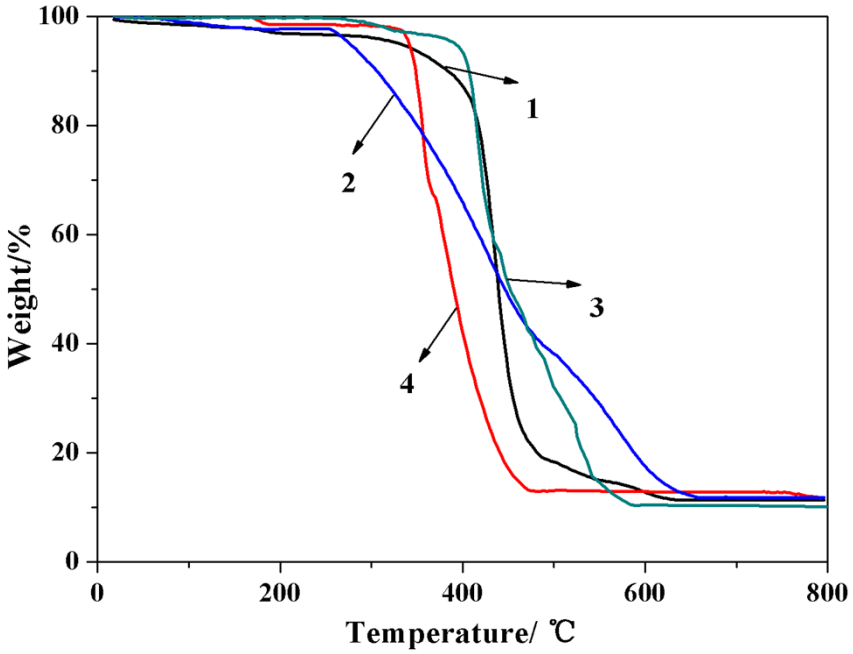
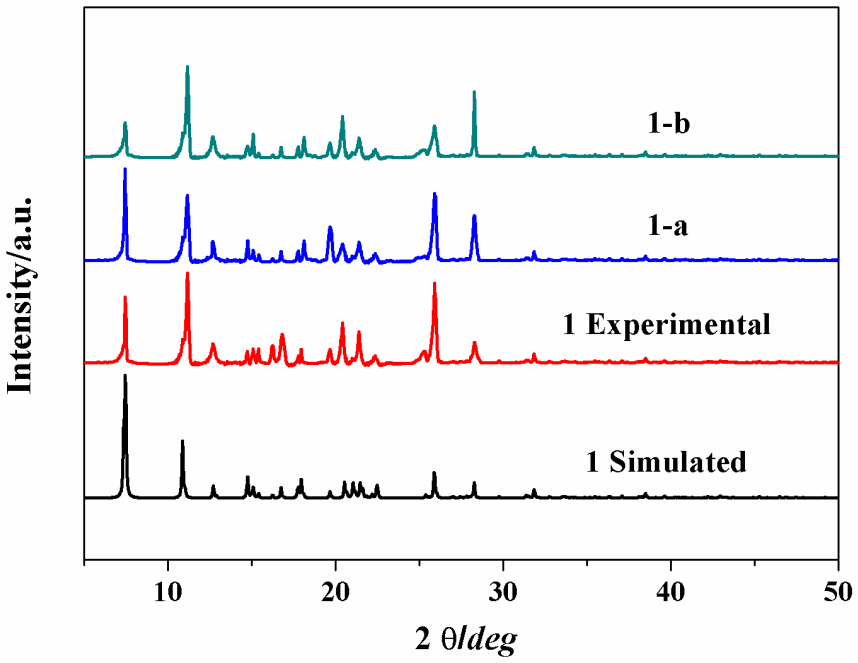
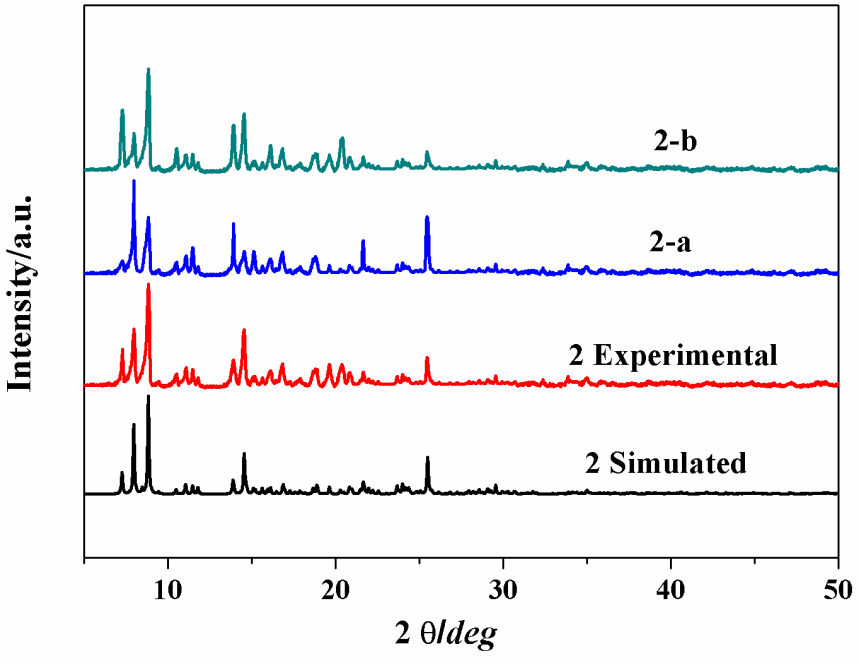


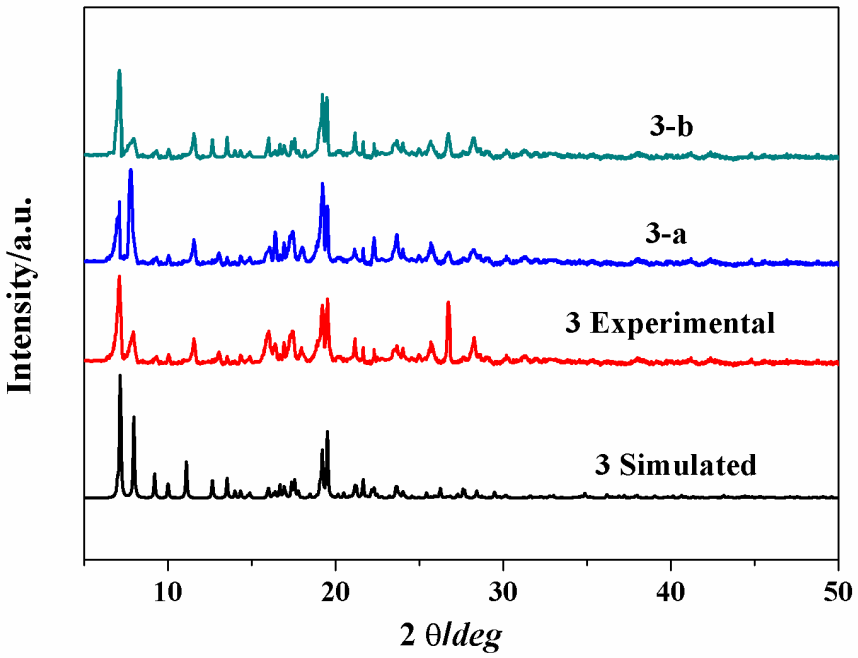

**Fig. S2** TG curves for **1-4**


1-b
1-a
1 Experimental
1 Simulated
Intensity/a.u.
10
20
30
40
50
2 θ/deg

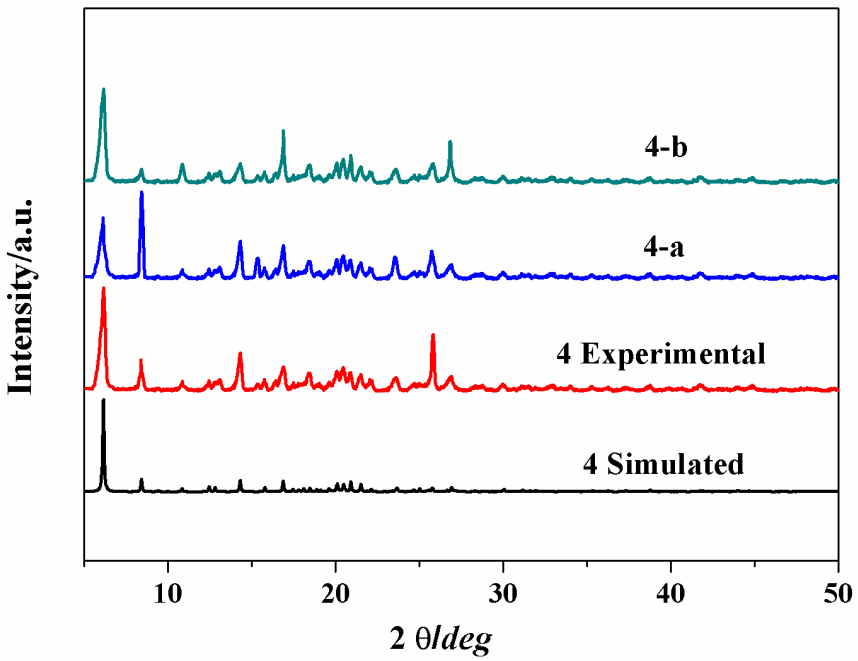
(a)


2-b
2-a
2 Experimental
2 Simulated
Intensity/a.u.
10
20
30
40
50
2 θ/deg

(b)




(c)




(d)

**Fig. S3** X-Ray powder diffraction patterns of **1-4**

**Table S1** Selected bond lengths (Å) and angles (°) for complexes **1**-**4**

| Parameter | Value | Parameter | Value |
|---|---|---|---|
| **1** | | | |
| Co(1)-O(2) | 1.9365(15) | Co(1)-N(1) | 2.0341(18) |
| O(2)-Co(1)-O(2)A | 136.39(11) | O(2)-Co(1)-N(1) | 106.78(8) |
| O(2)A-Co(1)-N(1) | 103.18(7) | O(2)-Co(1)-N(1)A | 103.18(7) |
| O(2)A-Co(1)-N(1)A | 106.78(8) | N(1)-Co(1)-N(1)A | 91.85(10) |
| **2** | | | |
| Co(1)-O(4) | 1.924(3) | Co(1)-O(5)A | 1.980(8) |
| Co(1)-N(1) | 2.025(3) | Co(1)-N(3) | 2.048(3) |
| Co(1)-O(6) | 2.281(5) | | |
| O(4)-Co(1)-O(5)A | 124.6(3) | O(4)-Co(1)-N(1) | 111.82(12) |
| O(5)A-Co(1)-N(1) | 117.8(2) | O(4)-Co(1)-N(3) | 102.83(16) |
| O(5)A-Co(1)-N(3) | 93.4(2) | N(1)-Co(1)-N(3) | 97.95(11) |
| O(4)-Co(1)-O(6) | 71.2(2) | O(5)A-Co(1)-O(6) | 87.0(2) |
| N(1)-Co(1)-O(6) | 88.19(15) | N(3)-Co(1)-O(6) | 172.78(16) |
| **3** | | | |
| Co(1)-N(1) | 2.072(4) | Co(1)-O(2) | 2.127(4) |
| Co(1)-N(3)A | 2.082(4) | Co(1)-O(3)B | 2.230(4) |
| Co(1)-O(4)B | 2.104(4) | Co(1)-O(1) | 2.237(4) |
| N(1)-Co(1)-N(3)A | 103.29(17) | N(1)-Co(1)-O(4)B | 95.19(15) |
| N(3)A-Co(1)-O(4)B | 98.45(17) | N(1)-Co(1)-O(2) | 88.73(15) |
| N(3)A-Co(1)-O(2) | 149.80(17) | O(4)B-Co(1)-O(2) | 108.06(15) |
| N(1)-Co(1)-O(3)B | 151.61(15) | N(3)A-Co(1)-O(3)B | 94.81(15) |
| O(4)B-Co(1)-O(3)B | 60.22(14) | O(2)-Co(1)-O(3)B | 86.29(14) |
| N(1)-Co(1)-O(1) | 100.89(16) | N(3)A-Co(1)-O(1) | 90.71(16) |
| O(4)B-Co(1)-O(1) | 159.17(16) | O(2)-Co(1)-O(1) | 59.58(14) |
| O(3)B-Co(1)-O(1) | 100.56(15) | | |
| **4** | | | |
| Co(1)-O(4)A | 2.021(2) | Co(1)-N(4)B | 2.097(3) |
| Co(1)-O(1) | 2.098(2) | Co(1)-O(1W) | 2.116(2) |
| Co(1)-N(1) | 2.210(3) | Co(1)-O(2) | 2.247(2) |
| O(4)A-Co(1)-N(4)B | 101.04(10) | O(4)A-Co(1)-O(1) | 108.47(9) |
| N(4)B-Co(1)-O(1) | 150.06(9) | O(4)A-Co(1)-O(1W) | 91.06(9) |
| N(4)B-Co(1)-O(1W) | 95.24(9) | O(1)-Co(1)-O(1W) | 89.28(9) |
| O(4)A-Co(1)-N(1) | 91.07(10) | N(4)B-Co(1)-N(1) | 86.09(10) |
| O(1)-Co(1)-N(1) | 88.36(9) | O(1W)-Co(1)-N(1) | 177.22(9) |
| O(4)A-Co(1)-O(2) | 168.95(9) | N(4)B-Co(1)-O(2) | 89.95(9) |
| O(1)-Co(1)-O(2) | 60.48(8) | O(1W)-Co(1)-O(2) | 89.10(9) |
| N(1)-Co(1)-O(2) | 88.46(9) | | |

Symmetry transformation used to generate equivalent atoms: For **1**: A, -*x*+1, *y*, -*z*+3/2.
For **2**: A, -*x*+3/2, -*y*+3/2, -*z*+1. For **3**: A, -*x*, -*y*+1, -*z*+1; B, -*x*+3/2, *y*+1/2, *z*.
For **4**: A, *x*, -*y*+3/2, *z*+1/2; B, -*x*+2, *y*-1/2, -*z*+1/2.

**Table S2** recycled and reused twice experimental results of complexes **1-4** for the degradation Congo red after 130 min

| Degradation efficiencies | Complex **1** | Complex **2** | Complex **3** | Complex **4** |
|---|---|---|---|---|
| First | 87% | 96% | 56% | 52% |
| Twice | 86% | 94% | 53% | 48% |