

Supplementary Information for:

Cobalt-Based Metal–Organic Framework Nanoparticles with Peroxidase-like Catalytic Activity for Sensitive Colorimetric Detection of Phosphate

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Figure captions

Figure S1. Co-MOF prepared with different 2-methylimidazole/cobalt salt mole ratio for catalytic oxidizing TMB in presence of H₂O₂. The absorbance was obtained at 652 nm.

Figure S2. The SEM images of Co-MOF prepared with 2-methylimidazole/cobalt salt mole ratio of 240: 10 (a), and 640: 10 (b).

Figure S3. The XPS spectra of Co-MOF for Co 2p.

Figure S4. The EDS spectrum (a) and nitrogen adsorption and desorption isotherms (b) of Co-MOF.

Figure S5. The absorbance changes of TMB-H₂O₂ system catalyzed with different concentrations of substance (a). Time dependent absorbance change of Co-MOF and leaching solution-involved TMB-H₂O₂ catalytic system (b). The absorbance was measured at 652 nm.

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TMB adding volume (d) on the catalytic activity of Co-MOF.

Figure S7. The conditions of H₂O₂ volume (a), Co-MOF concentration (b), time (c) on the catalytic activity of Co-MOF, and the catalytic stability of Co-MOF for 16 storage days (d).

Figure S8. The FT-IR spectra of Co-MOF after addition of Pi (a), the XPS pattern of Co-MOF after addition of Pi (b), the XPS pattern of Co 2p in Co-MOF with and without Pi addition (c), and the XPS pattern of O 1s in Co-MOF with and without Pi addition (d).

Figure S9. Zeta potential value of Co-MOF with and without the addition of Pi.

Figure S10. The ESR spectra of Co-MOF before and after adding Pi. (25 mM DMPO was added.)

Table captions

Table S1. The BET parameters of Co-MOF.

Table S2. Comparison of the apparent Michaelis-Menten constant (K_m), maximum reaction rate (V_{max}) of Co-MOF with other reported substance or nanomaterials.

Table S3. Comparison of the proposed method with other nanomaterials-related methods for Pi determination.

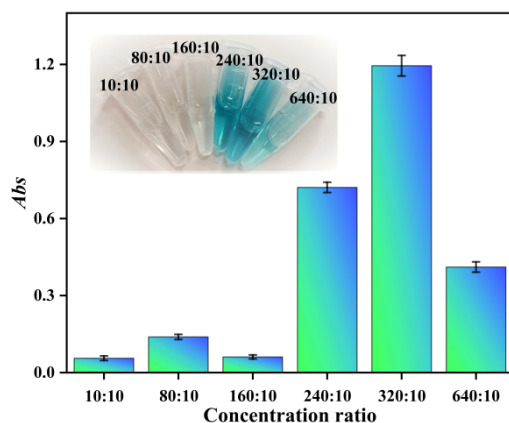


Figure S1. Co-MOF prepared with different 2-methylimidazole/cobalt salt mole ratio for catalytic oxidizing TMB in presence of H_2O_2 . The absorbance was obtained at 652 nm.

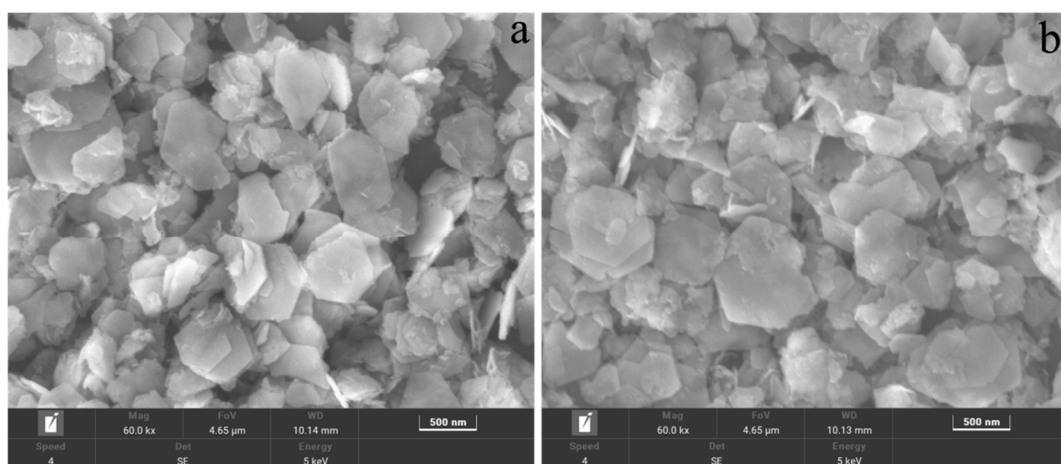


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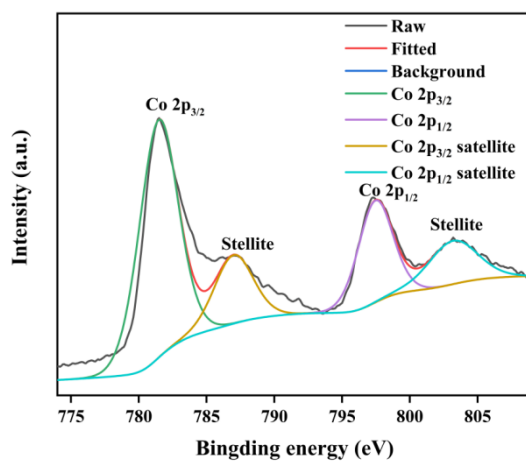


Figure S3. The XPS spectra of Co-MOF for Co 2p.

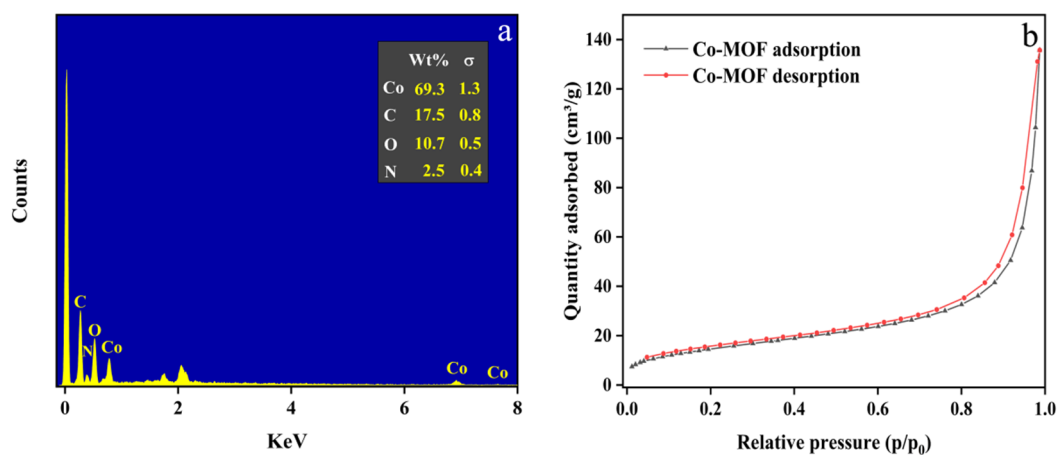


Figure S4. The EDS spectrum (a) and nitrogen adsorption and desorption isotherms (b) of Co-MOF.

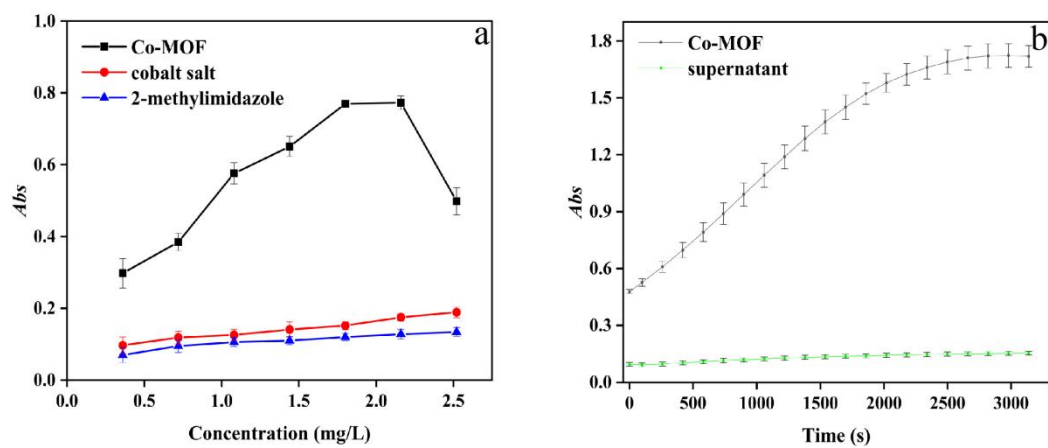


Figure S5. The absorbance changes of TMB- H_2O_2 system catalyzed with different concentrations of substance (a). Time dependent absorbance change of Co-MOF and leaching solution-involved TMB- H_2O_2 catalytic system (b). The absorbance was measured at 652 nm.

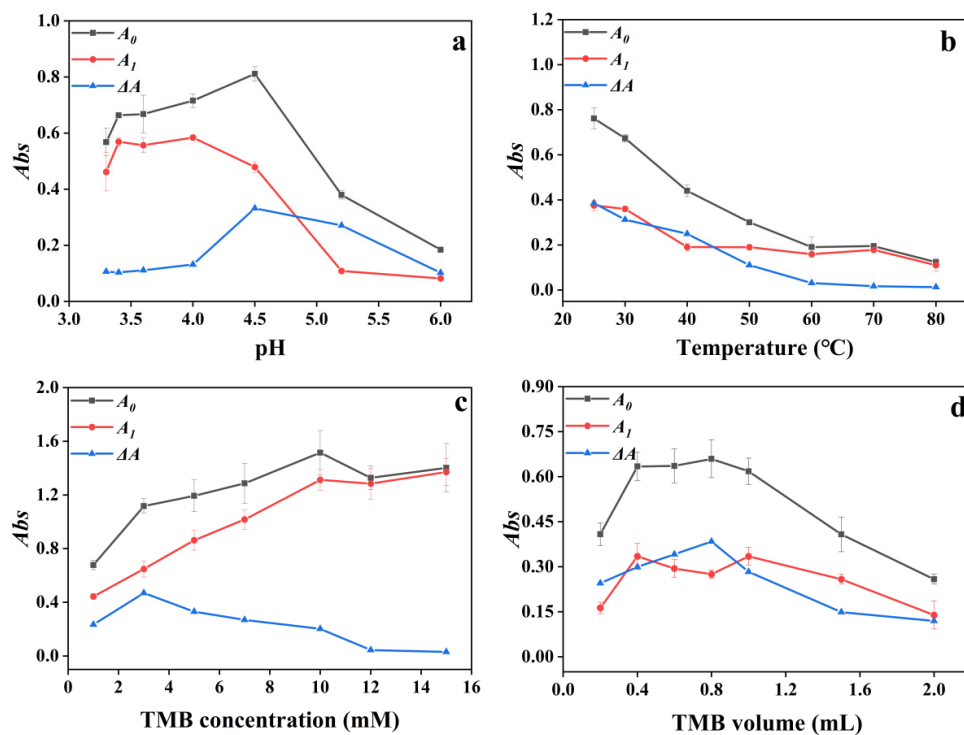


Figure S6. The conditions of reaction pH (a), reaction temperature (b), TMB concentration (c), TMB adding volume (d) on the catalytic activity of Co-MOF.

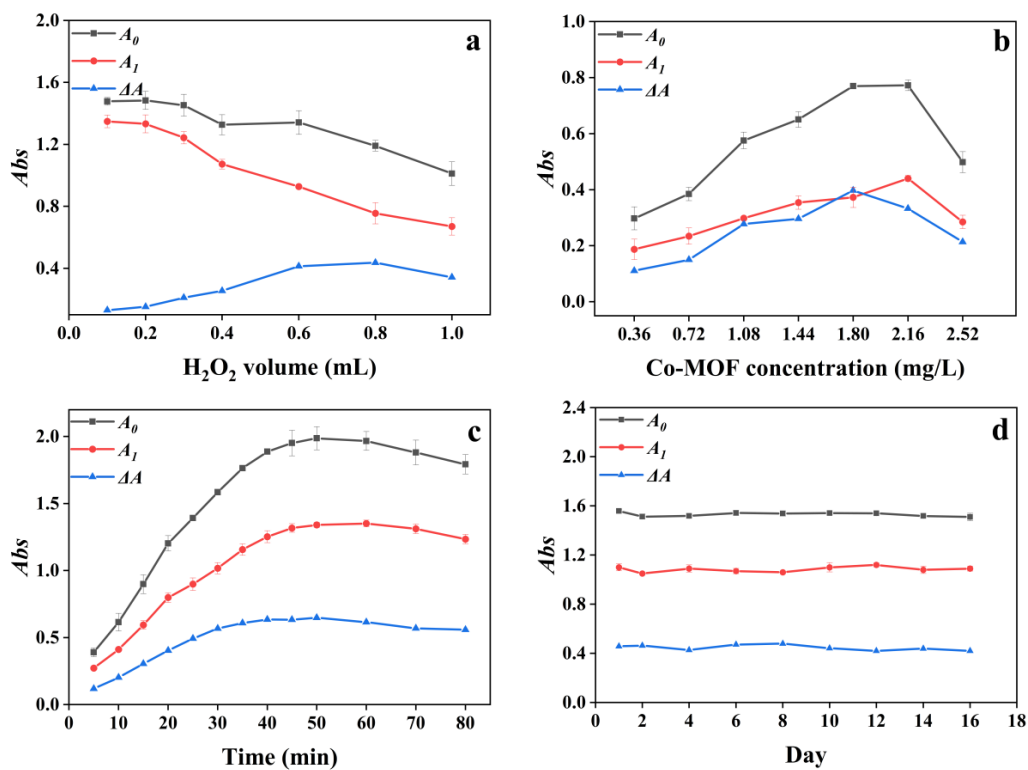


Figure S7. The conditions of H_2O_2 volume (a), Co-MOF concentration (b), time (c) on the catalytic activity of Co-MOF, and the catalytic stability of Co-MOF for 16 storage days (d).

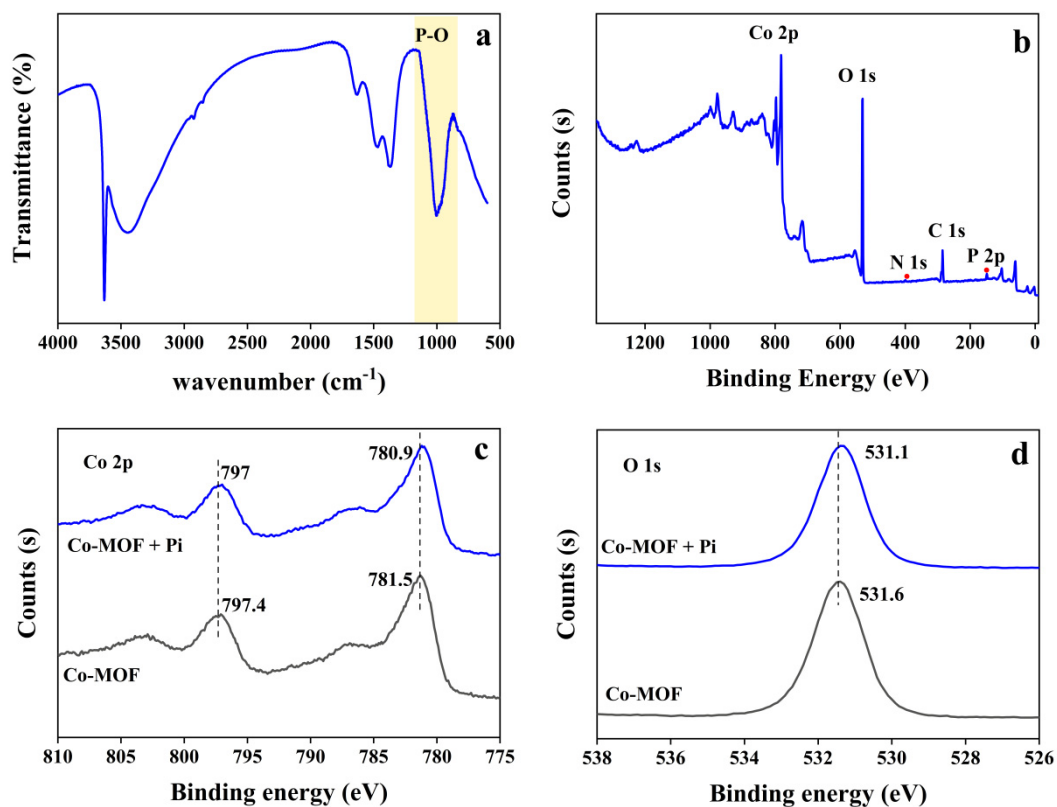


Figure 8. The FT-IR spectra of Co-MOF after addition of Pi (a), the XPS pattern of Co-MOF after addition of Pi (b), the XPS pattern of Co 2p in Co-MOF with and without Pi addition (c), and the XPS pattern of O 1s in Co-MOF with and without Pi addition (d).

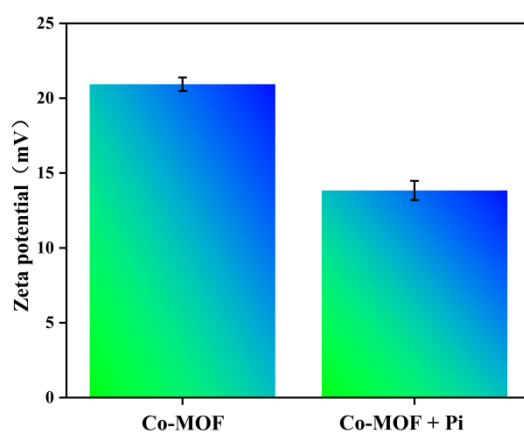


Figure S9. Zeta potential value of Co-MOF with and without the addition of Pi.

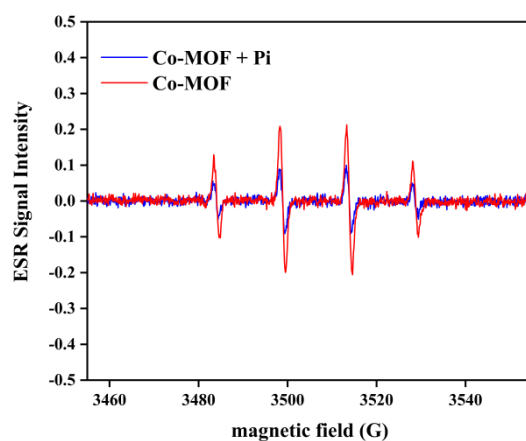


Figure S10. The ESR spectra of Co-MOF before and after adding Pi. (25 mM DMPO was added.)

Table S1. The BET parameters of Co-MOF.

Nanomaterials	BET surface area (m ² /g)	Total pore volume (cm ³ /g)	Average pore size (nm)
Co-MOF	53.62	0.1761	13.14

Table S2. Comparison of the apparent Michaelis-Menten constant (K_m), maximum reaction rate (V_{max}) of Co-MOF with other reported substance or nanomaterials.

Catalyst	Substance	K_m [mM]	V_{max} [10^{-7} M s ⁻¹]	Reference
Co-MOF	TMB	0.72	3.12	This paper
Co-MOF	H ₂ O ₂	0.20	4.23	This paper
HRP	TMB	0.52	3.01	This paper
HRP	H ₂ O ₂	0.19	9.03	This paper
MIL-53(Fe)	TMB	1.08	8.87	[23]
MIL-53 (Fe)	H ₂ O ₂	0.04	4.3	[23]
Fe-Co alloy NPs	TMB	1.79	4.56	[24]
Fe-Co alloy NPs	H ₂ O ₂	0.060	1.32	[24]

Table S3. Comparison of the proposed method with other nanomaterials-related methods for Pi determination.

Elements	Method	Linear range (μM)	Detection limit (μM)	Reference
MWCNTs-SH and AuNPs ^a	Square wave voltammetry	5.2-156.3	3.1	[10]
[Tb-EDTA] ⁻¹ and Au NPs-CTAB ^b	fluorescence	6.30-750	1.80	[30]
Eu-ICP ^c	fluorescence	2-100	0.84	[31]
PCN-224 ^d	fluorescence	0-10	0.054	[32]
silver nanorods	colorimetry	2-240	0.076	[33]
MA-AuNPs ^e	colorimetry	0.050-0.30	0.076	[34]
CUNPs ^f	colorimetry	1.04-43.75	0.75	[35]
Co-MOF	colorimetry	0.093-1.5*	0.052*	This paper

^aMWCNTs-SH and AuNPs are abbreviated from silanized multi-walled carbon nanotubes and Au nanoparticles, respectively.

^b[Tb-EDTA]⁻¹ and Au NPs-CTAB are abbreviated from luminescent probe and gold nanoparticles capped with a cetyltrimethylammonium bromide, respectively.

^cEu-ICP is abbreviated from europium-based infinite coordination polymer nanospheres.

^dPCN-224 is abbreviated from a porphyrin-based nano metal-organic framework.

^eMA-AuNPs is abbreviated from carboxylate group-modified anti-aggregation gold nanoparticles.

^fCUNPs is abbreviated from curcumin nanoparticles.

*The data was obtained by the transformation with molecular weight of Pi (96).