Supporting Information

A micron-sized Co-MOF sheet to active peroxymonosulfate for efficient organic pollutant degradation

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Test S1. Materials and characterization

X-ray single-crystal data collection for BUC-92, the same to our previous report,[1] was carried out with a Rigaku oxford diffraction XtaLAB mini II detector diffractometer with Mo K_α radiation (λ = 0.71073 Å) at 293(2) K. The SMART software was used for data collection and the SAINT software for data extraction. Empirical absorption correction was performed with the SADABS program. The structure was solved using Olex2 with the SIR2004 structure solution program using Direct Methods and refined with the ShelXL refinement package using Least Squares minimization.[2, 3] All the chemicals were of analytical grade and were used as received without further purification. Powder X-ray diffraction (PXRD) patterns were tested by a Dandonghaoyuan DX-2700B diffractometer in the range of 2θ = 5 – 50° using Cu-Kα radiation. The scanning electron microscope (SEM) was acquired by TM3030Plus Main Unit. The Electrochemical measurements were tested by Metrohm Autolab PGSTAT204 electrochemical station with 0.2 mM Na_2SO_4 solution (pH = 5.0) as the electrolyte in a typical three-electrode mode. The electron spin resonance (ESR) signals of the spin-trapped radicals were examined on a JES FA200 spectrometer using the 5,5-dimethyl-1-pyrroline N-oxide (DMPO) and 2,2,6,6-Tetramethylpiperidine (TEMP) in dark conditions. The released Co ion was detected by ICP-5000, Focused Photonics Inc., China. The concentration changes of RhB solution was tested by Laspec Alpha-1860 spectrometer at the maximum absorbance 554 nm.

Test S2. Synthesis of BUC-92 and BUC-67

BUC-92 was synthesized by solvothermal method. Briefly, a mixture of $CoCl_2 \cdot 6H_2O$ (0.3 mmol, 71.38 mg) and H_2L (0.3 mmol, 106.31 mg), 1.0 mL N, N-Dimethylformamide (DMF) and 14.0 mL deionized water were sealed in a 25 mL Teflon-lined stainless steel Parr bomb, which was heated at 170 °C for 12 h.

BUC-67 was synthesized by hydrothermal method similar with that of BUC-92, while 0.3 mmol bpy was added in and without use of DMF and the reaction condition was 160 °C for 72 h.[4]

Test S3. RhB degradation over BUC-92 and BUC-67

10 mg catalyst was added into 50.0 mL aqueous solution containing RhB (10 mg L^{-1}), in which 40 μL PMS (250 mM) was added. At given time intervals, 1.2 mL solution was drawn for determination.

Fig. S1 EDS mapping of BUC-92 sheet
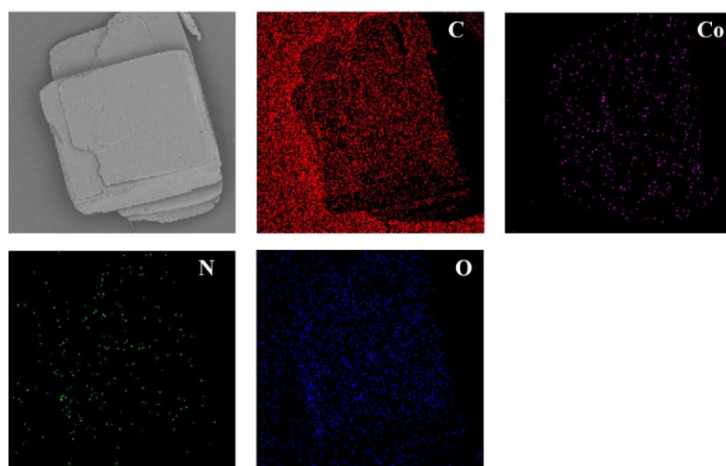

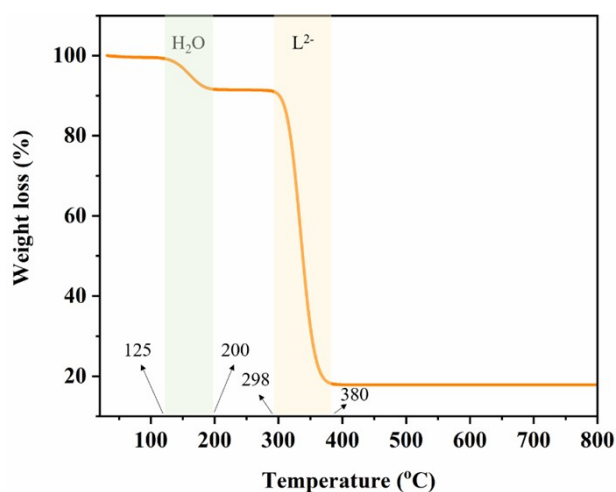Fig. S2 TGA of BUC-92

Table S1 Selected bond lengths and angles of BUC-92

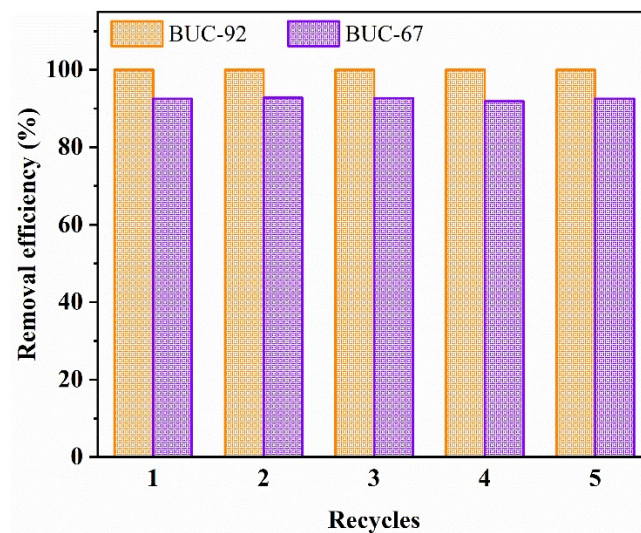| Bond lengths (Å)			
Co1—O1	2.042 (3)	Co1—O2W	2.117 (4)
Co1—O1W	2.081 (3)	Co1—O4	2.061 (3)
Co1—O2	2.110 (3)	Co1—N1	2.317 (3)
Bong angles (º)			
O1—Co1—O1W 9	90.22 (12)	O1W—Co1—O2W	90.02 (18)
O1—Co1—O2	88.49 (12)	O1W—Co1—N1	90.63 (12)
O1—Co1—O2W	88.31 (18)	O2—Co1—O2W	89.24 (18)
O1—Co1—O4	171.92 (12)	O2—Co1—N1	90.25 (11)
O1—Co1—N1	97.99 (12)	O2W—Co1—N1	173.67 (17)
O1W—Co1—O2	178.53 (13)	O4—Co1—O1W	95.02 (13)
O4—Co1—O2	86.34 (13)	O4—Co1—O2W	97.81 (18)
O4—Co1—N1	75.86 (13)		

Fig. S3 Cyclic experiments of RhB degradation over BUC-92 and BUC-67 via PMS activation.
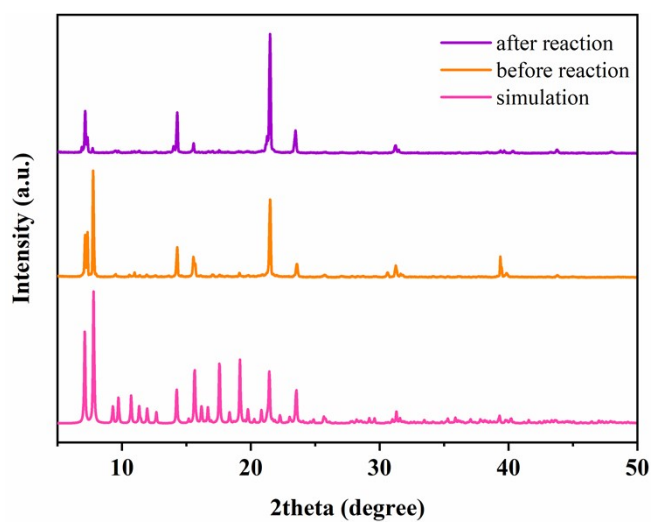

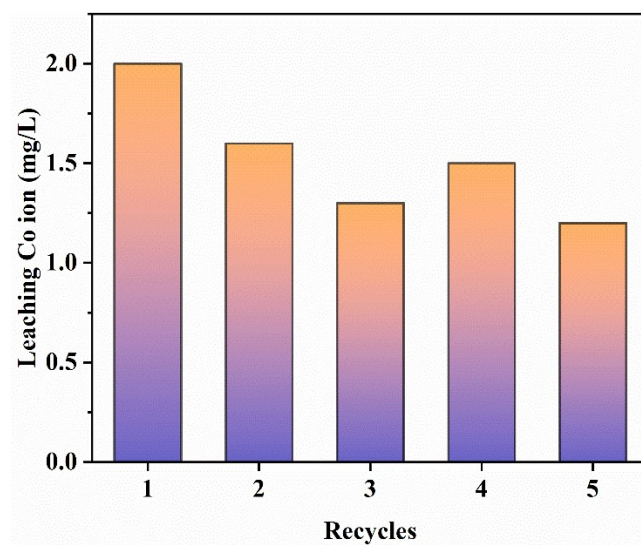Fig. S4 XRD patterns of BUC-67.

Fig. S5 Concentration of the leaching Co ion from BUC-92 at different recycles.
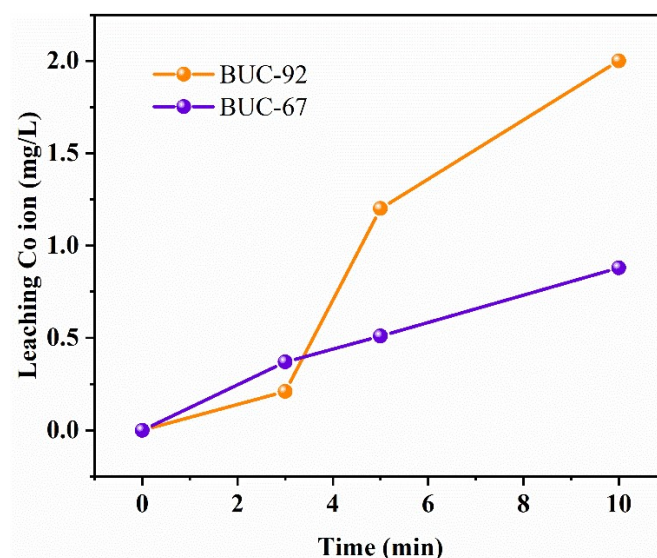
Fig. S6 Concentration of the leaching Co ion with time. Reaction conditions: 10 mg catalyst, 0.2 mM PMS, 50 mL 10 mg/L RhB, initial pH, in dark.
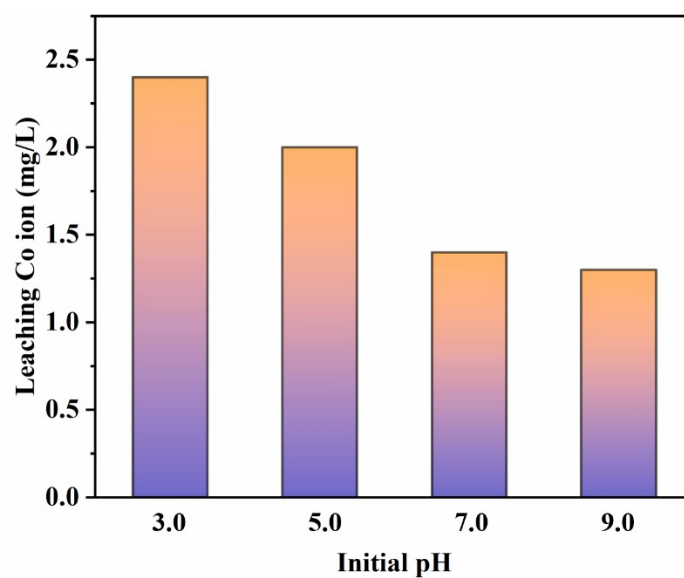

Fig. S7 Concentration of the leaching Co ion from BUC-92 under different pH values. Reaction conditions: 10 mg catalyst, 0.2 mM PMS, 50 mL 10 mg/L RhB, in dark.
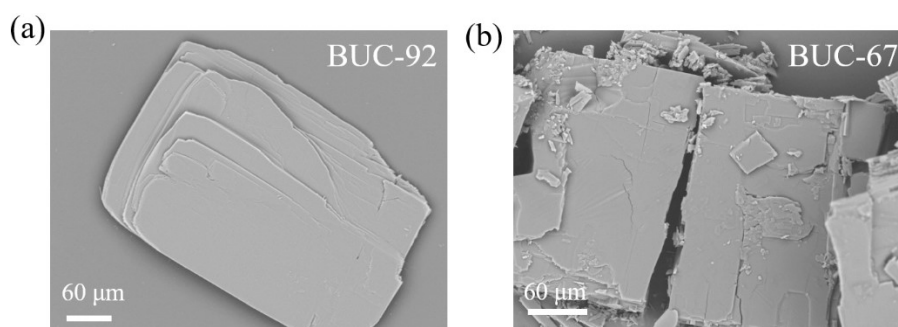

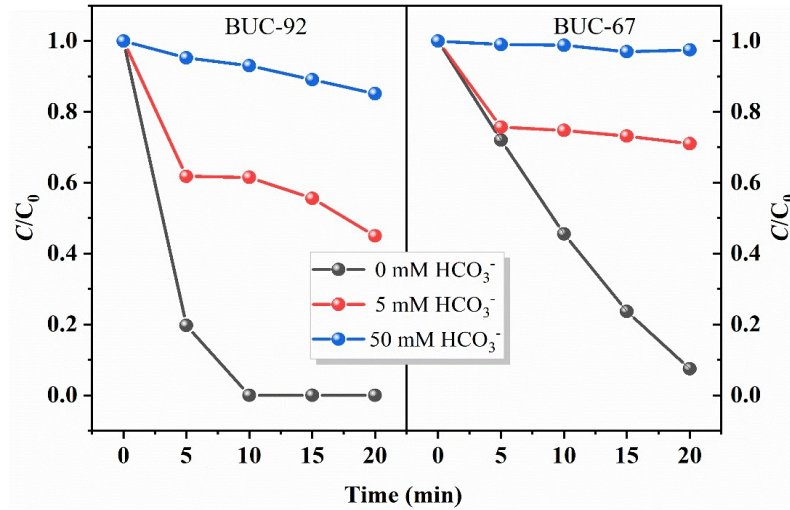Fig. S8 SEM images of (a) BUC-92, (b) BUC-67 after reaction.

Fig. S9 Influences of HCO$_3^-$ on RhB degradation over BUC-92 and BUC-67 via PMS activation. Reaction conditions: 10 mg catalyst, 0.2 mM PMS, 50 mL 10 mg/L RhB, in dark.
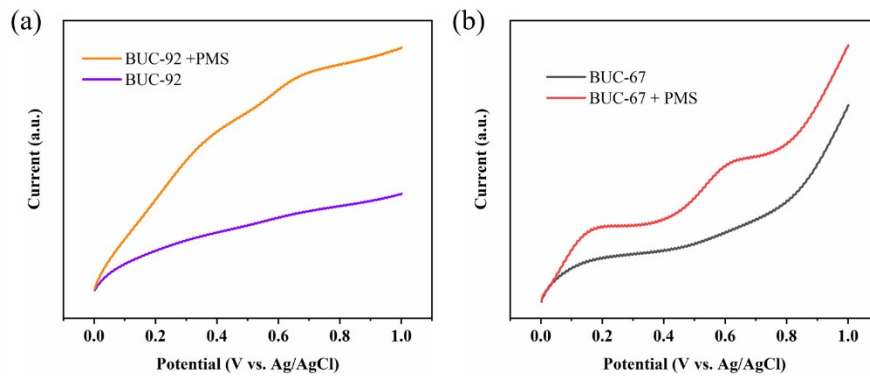

Fig. S10 Linear sweep voltammetry (LSV) curves of (a) BUC-92 and (b) BUC-67 with/without PMS
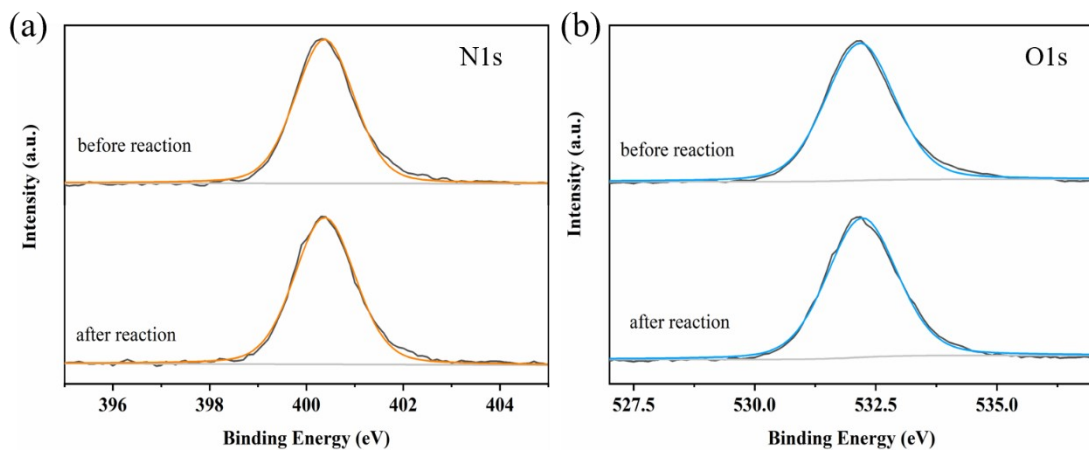

Fig. S11 XPS spectra of (a) N1s and (b) O1s in BUC-92 before and after reaction.

Table S2 Comparison of PMS activation activities toward RhB over different Co-based catalysts

catalyst	Dosage (mg/L)	RhB C_0 (mg/L)	PMS (mM)	Time (min)	Removal (%)	Ref.
S-Co-MOF	20	9.6	0.2	10	100	5
Zn/Co-ZIF	150	50	0.4	10	100	6
HAnW@CoMOF	600	15	1.8	0.5	100	7
NbCo-MOF	200	20	0.5	10	100	8
Co$_3$O$_4$-NCNF	140	20	0.8	3	100	9
BUC-92	200	10	0.2	10	100	This work

Note: HAnW = hydroxyapatite nanowires; NCNF = N-doped carbon nanosheet frameworks.

References

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