Supporting Information

A "turn-on" fluorescent sensor for the selective detection of erythromycin in aqueous solution

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Contents

S-I Characterization and Measurements

***Materials*:** Copper nitrate trihydrate ($Cu(NO_3)_2 \cdot 3H_2O$) and tetracycline (TCY) were bought from Hangzhou Jigong Biotechnology Co., LTD. Erythromycin (ERY), amoxicillin (AMX), chloramphenicol (CHL), thiamine (VB), levofloxacin (LVX), N, N-Dimethylformamide (DMF) were bought from Shanghai Titan Technology Co., LTD. 2-amino-1,4-benzene-dicarboxylic acid (1,4-BDC-NH_2) was bought from Shanghai Bidd Pharmaceutical Technology Co., LTD. Doxycycline (DOX) was bought from Hangzhou Bangyi Chemical Co., LTD. Chlortetracycline (CET) and Polyvinylpyrrolidone (PVP) were bought from Hangzhou Double Wood Chemical Co., LTD. Oxytetracycline (OXY) was bought from Shanghai Merrier Biochemical Technology Co., LTD. In the experiment, all reagents and solvents were of analytical grade, and the experimental water was ultrapure water with a resistivity of 18.25 MΩ/cm.

***ERY sensing properties*:** 3 mg of Cu-BDC-NH_2 powder was dispersed in 20 ml of ultrapure water and sonicated for 10 minutes to prepare a fluorescent probe suspension. Subsequently, 2ml of the MOF suspension was transferred to a 5ml cuvette, followed by the sequential addition of ERY solutions at different concentrations. Finally, water was added until the volume reached 3 ml. The mixture was incubated at room temperature for 5 minutes. Subsequently, the fluorescence intensity at an emission wavelength of 430 nm was recorded under excitation at 340 nm. To ensure the precision of the measurement results, each sample is measured three times simultaneously.

***Real sample detection by a fluorescence sensor*:** The efficacy of the ERY detection method and fluorescence sensor were evaluated using authentic water samples. Tap water was procured from the Moganshan Campus of Zhejiang University of Technology, and the artificial lake mentioned in Table 1 is located on the Moganshan Campus of Zhejiang University of Technology in Huzhou, Zhejiang Province, China.

Before analysis, the samples were filtered through a 0.2 μm membrane to remove extraneous impurities.

***Preparation of Cu-BDC-NH₂ test strips*:** ERY rapid detection strips were prepared based on Cu-BDC-NH_2 using the dipping method. 3 mg/mL Cu-BDC-NH_2 aqueous solution was prepared, and qualitative filter paper was cut into rectangles and soaked in the solution overnight. The filter paper was then vacuum-dried at 60°C overnight, resulting in Cu-BDC-NH_2 test strips.

***Cycling Tests*:** Following the completion of the measurement, the Cu-BDC-NH_2 suspension is subjected to centrifugation to remove the supernatant. The resulting green powder is then washed on three occasions with ethanol, after which it is subjected to vacuum drying at room temperature. The recovered sample is then reused for the detection of erythromycin. This procedure is repeated four times.

S-II Figures

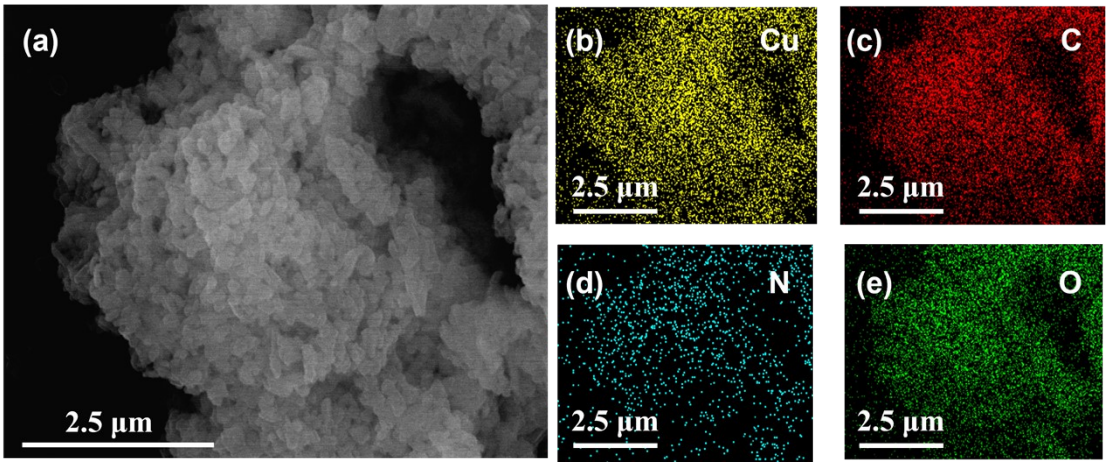

Figure S1. EDS of Cu-BDC-NH_2.

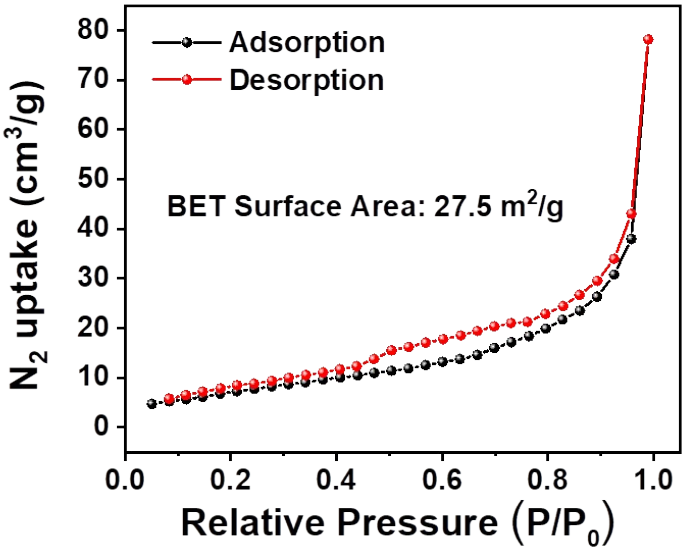

Figure S2. N_2 adsorption/desorption isotherms of Cu-BDC-NH_2 recorded at -195.85 °C.

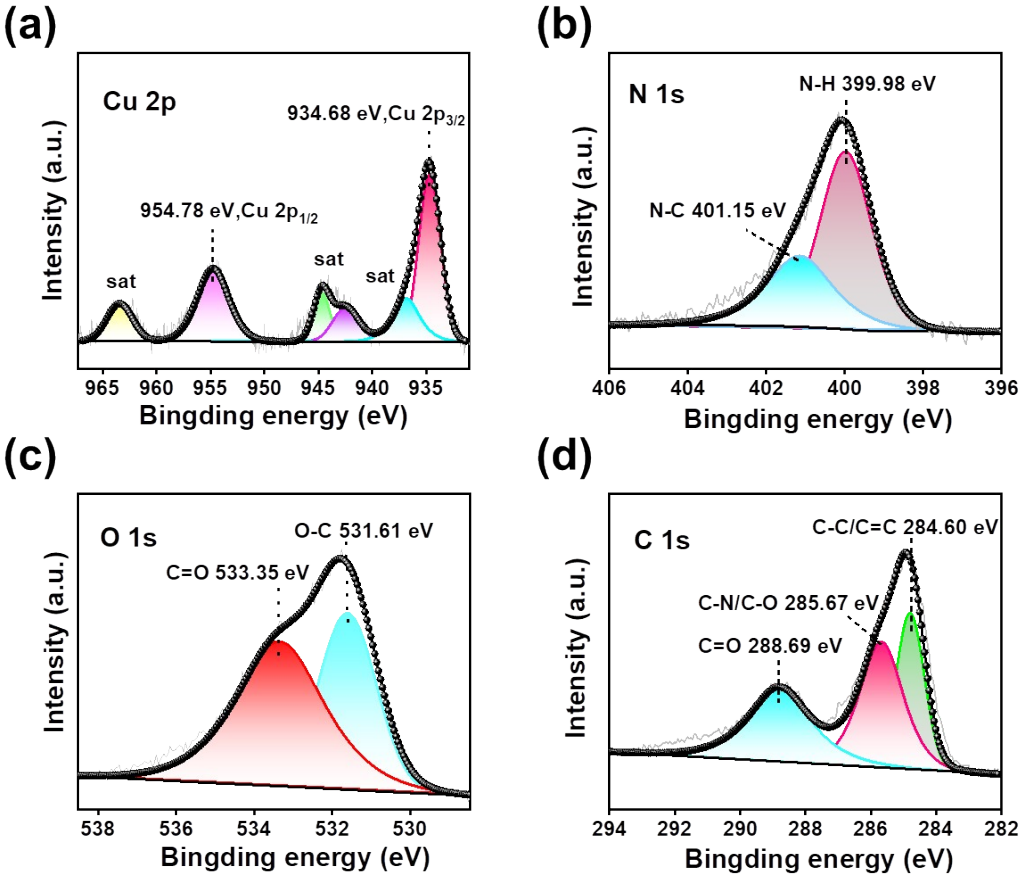

Figure S3. (a) Cu 2p, (b) N 1s, (c) O 1s and (d) C 1s XPS spectra of Cu-BDC-NH_2.

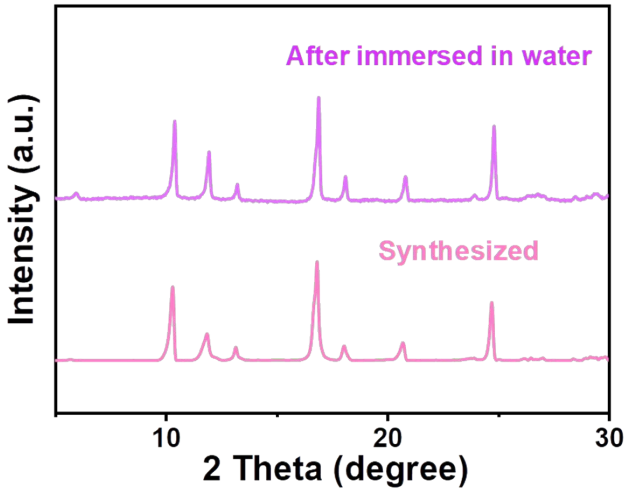

Figure S4. PXRD patterns of Cu-BDC-NH_2 before and after immersed in water for 24 h.

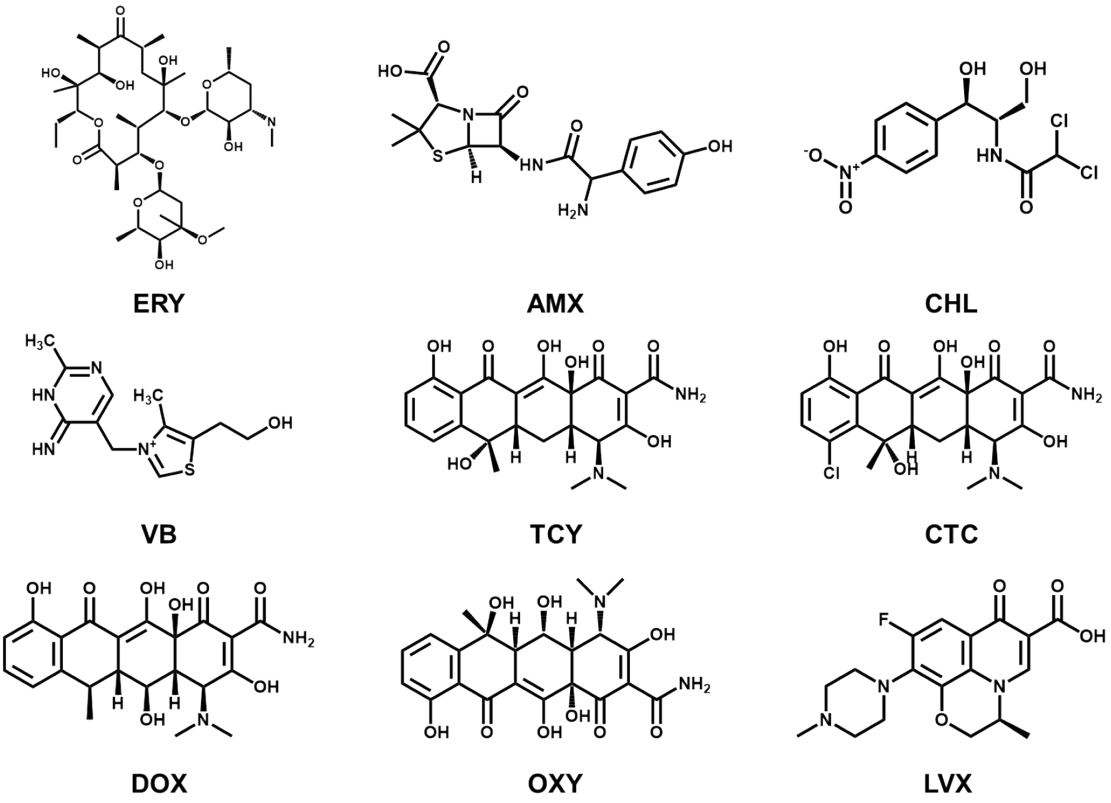

Figure S5. The molecular structures of various antibiotics.

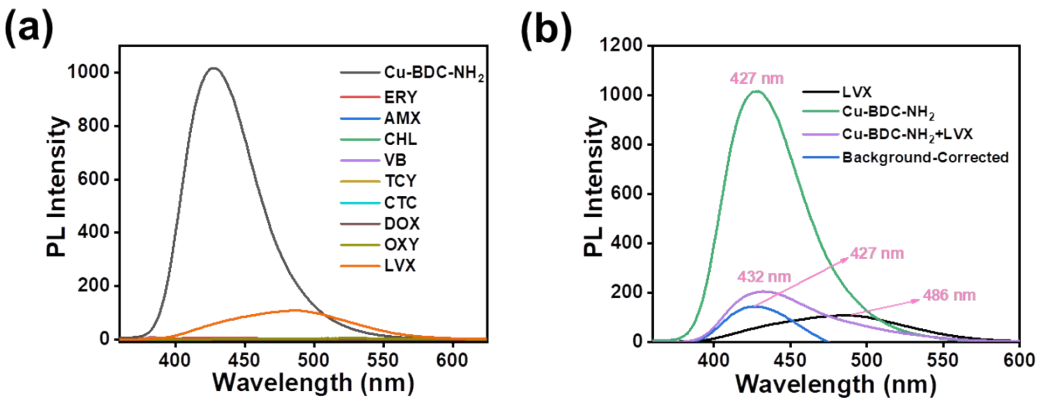

Figure S6. (a) The emission spectra of Cu-BDC-NH_2 and analytes; (b) PL spectra of LVX, Cu-BDC-NH_2, Cu-BDC-NH_2 with LVX, and Cu-BDC-NH_2 with LVX after subtraction of LVX fluorescence intensity.

In **Figure S6a**, the PL spectra of the probe and various antibiotics were recorded at concentrations of 0.15 mg/mL and 5×10^{-4} mol/L, respectively. Compared to the emission of the probe, the analytes exhibit almost no luminescence except for LVX. In **Figure S6b**, LVX shows a sky-blue emission at 486 nm, while the probe exhibits

strong fluorescence at 427 nm. Upon the addition of LVX to the LMOF suspension, the emission intensity of the fluorescent probe decreases and undergoes a red shift to 432 nm. After subtracting the emission spectrum of LVX, a quenching spectrum of the probe is obtained with a quenching efficiency of 86%.

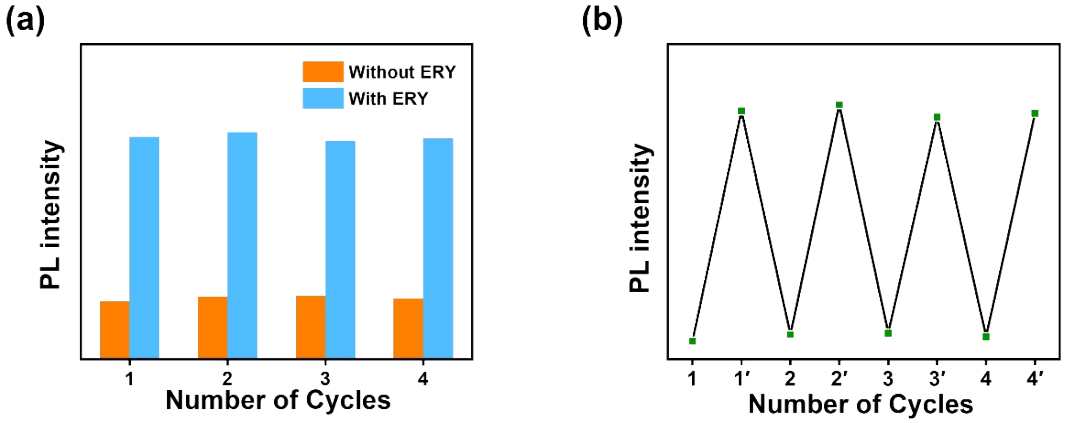

Figure S7. Emission intensity of four recyclable experiments of sensing ERY.

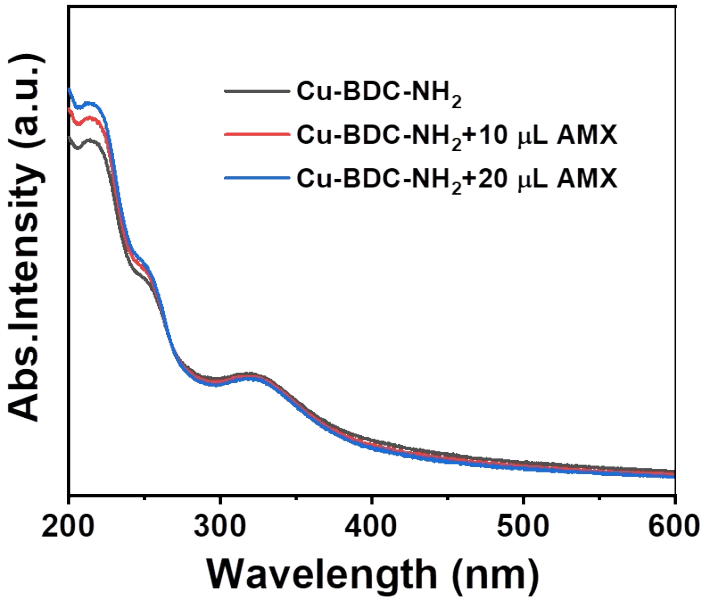

Figure S8. UV-vis absorption spectra of Cu-BDC-NH_2 with increasing AMX concentrations.

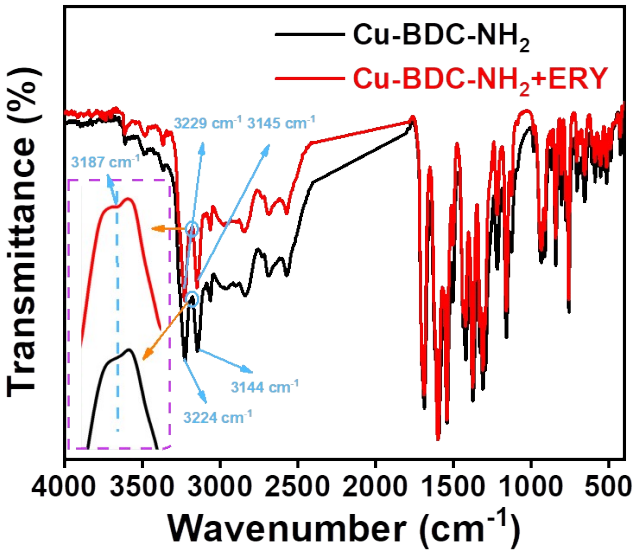

Figure S9. FTIR spectroscopy of Cu-BDC-NH_2 before and after the addition of ERY.

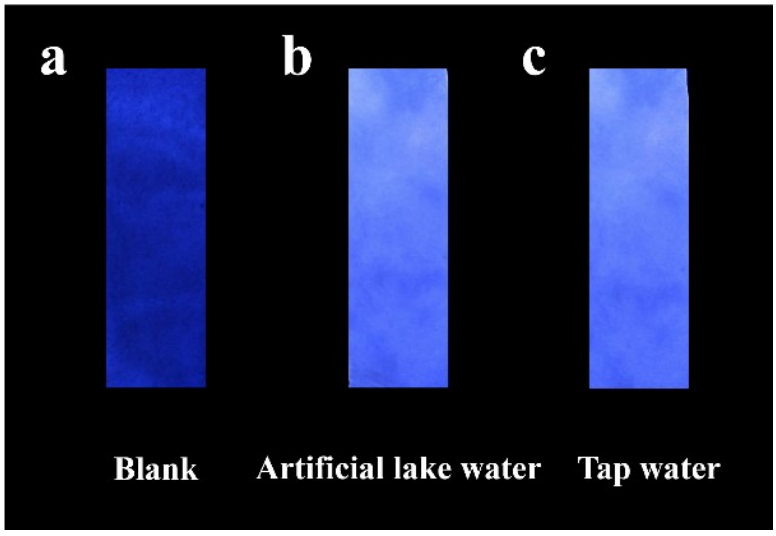

Figure S10. Photographs of test strips for blank (a), artificial lake water with ERY concentration at 1 mmol/L (b) and tap water with ERY concentration at 1 mmol/L (c).

S-III Tables

Table S1. Comparison of different fluorescent probes for detecting ERY.

Sensors	Material Types	LOD (M)	References
$Co(L)(HCPG)_2(H_2O)_2$	MOF	1.88×10^{-6}	[1]
$Ni(L)(HCPG)_2(H_2O)_2$	MOF	6.79×10^{-7}	[1]
$[Cd(DBIM)_{0.5}(m\text{-}BDC)(2H_2O)]_n$-3	MOF	9.038×10^{-4}	[2]
AuNCs@SiO2-MIPs	Metallic NPs	1.20×10^{-8}	[3]
EHMC	FOSMPs	1.78×10^{-8}	[4]
Cu-BDC-NH_2	MOF	1.4×10^{-7}	This work

S-IV References

1. J. Geng, Y. Chen, S. Xie, H. Lin and X. Wang, Ultraversatile Fluorescent Sensors Based on Two CoII/NiII Coordination Polymers for Identifying Various Antibiotics via the Turn-On/Off Effect and Detecting pH, *Inorg. Chem.*, 2023, **62**, 5158-5167.
2. L. Liu, H.J. Wang, L.B. Qu, C.X. Li, Y. Li and C.X. Cui, Cd(II) coordination complexes built from semirigid bis(dimethylbenzimidazole) ligand and different carboxylates: Fluorescent sensor and recognition mechanism for p-nitrophenol, erythromycin and 2,6-dichloro-4-nitroaniline, *J. Mol. Struct.*, 2024, **1310**, 138278.
3. Y. Zhang, Z. Zhou, J. Zheng, H. Li, J. Cui, S. Liu, Y. Yan and C. Li, SiO_2-MIP core-shell nanoparticles containing gold nanoclusters for sensitive fluorescence detection of the antibiotic erythromycin, *Microchimica Acta*, 2017, **184**, 2241-2248.
4. N.N. Li, X.Y. Xu, P. Qiu, Y.X. Li, X.S. Yu, Y.E. Gao, H.X. Ren, M. Muddassir, W.Y. Lin and Z.A. Zong, A novel AIE material for sensing of Erythromycin in pure water by hydrogen bond in portable test strips and cellular imaging applications, *Spectrochim. Acta. A*, 2023, **303**, 123272.