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Supporting Information

MOFs-mediated dual energy transfer nanoprobe integrated with Exonuclease III amplification strategy for highly sensitive detection of DNA

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Materials

Zirconium tetrachloride ($ZrCl_4$, 98%) and 2-aminoterephthalic acid (H_2N-H_2BDC, 98%) were obtained from Aladdin (Shanghai, China). N,N'-dimethylformamide (DMF, AR), acetic acid(AR), sodium chloride (NaCl, AR), and magnesium chloride ($MgCl_2$, AR) were obtained from Sinopharm Chemical Reagent Co., Ltd (Shanghai, China). Agarose, 6×loading buffer, and GelRed (10000×) nucleic acid stain were purchased from Shanghai Sangon Biotech Co., Ltd (China). The DNA sequences purified by high-performance liquiAd chromatography (HPLC), were obtained from Shanghai Sangon Biotech Co., Ltd (China). All the sequences are listed as following:

FDNA: 5′-*AGA AGA GAA G<u>TC CAT ATA ACT GAA AGC CAA</u>*-FAM-3′

QDNA:5′-BHQ1-*<u>GT TAT ATG GAC TTC</u> CCCCCCCCCCCCCCCCCCC*-3′

HBV-DNA: 5′-*<u>TTG GCT TTC AGT TAT ATG GA</u>T GAT GTG GTA*-3′

Mis-1: 5′-GTG GCT TTC AGT TAT ATG GAT GAT GTG GTA-3′

Mis-2: 5′-GTG GCT TTC AAT TAT ATG GAT GAT GTG GTA-3′

Mis-3: 5′-GTG GCT TTC AAT GAT ATG GAT GAT GTG GTA-3′

HPV-DNA: 5′-CTC ATA ACA GTA GAG ATC AGT T-3′

HIV-DNA: 5′-CCC TTT ACT GCT AGA GAT TTT CCA CAT TTT CCC G-3′

FAM-A20: 5′-FAM-*AAAAAAAAAAAAAAAAAAAA*-3′

FAM-T20: 5′-FAM-*TTTTTTTTTTTTTTTTTTTT*-3′

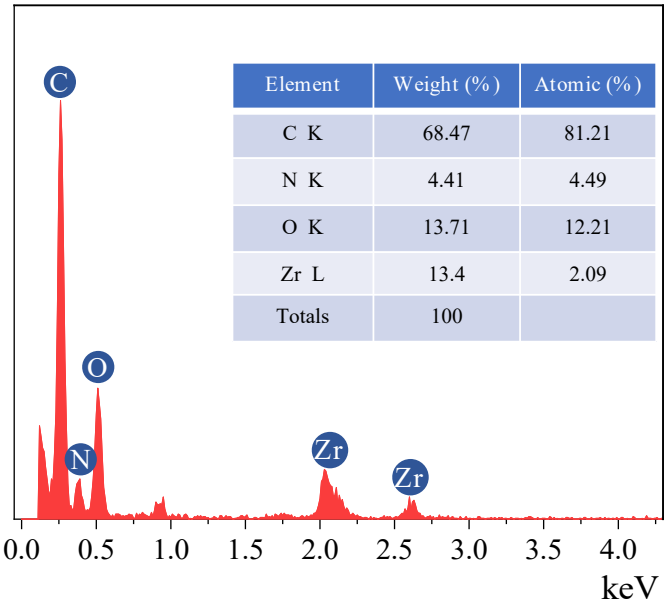
FAM-C20: 5′-FAM-*CCCCCCCCCCCCCCCCCCCC*-3′

FAM-G20: 5′-FAM-*GGGGGGTGGGGGGTGGGGGG*-3′

The buffer we used during the research was composed of 25 mM HEPES (pH 7.6), 150 mM NaCl and 1 mM $MgCl_2$. The ultrapure water used in all experiments was prepared on a Millipore milliq water purification system (Billerica, MA, USA).

Apparatus

Transmission electron microscopy (TEM) and scanning electron microscopy (SEM) were imaged using a JEM-2100F microscopy and Zeiss Sigma-500 FESEM, respectively. X-ray diffraction (XRD) analysis was performed using a Bruker D8 Advance X-ray diffractometer. Fourier-transform infrared (FTIR) spectra ranging from 500 to 4000 cm^{-1} were recorded on an IRTracer-100 instrument. DNA concentration was quantified using a UV-2600 spectrophotometer purchased from Shimadzu. Fluorescence spectra were measured using a Cary Eclipse fluorescence spectrophotometer (Varian, USA). The obtained data were processed using Origin software.



Element	Weight (%)	Atomic (%)
C K	68.47	81.21
N K	4.41	4.49
O K	13.71	12.21
Zr L	13.4	2.09
Totals	100	

Fig. S1 EDS analysis of UiO-66-NH_2.

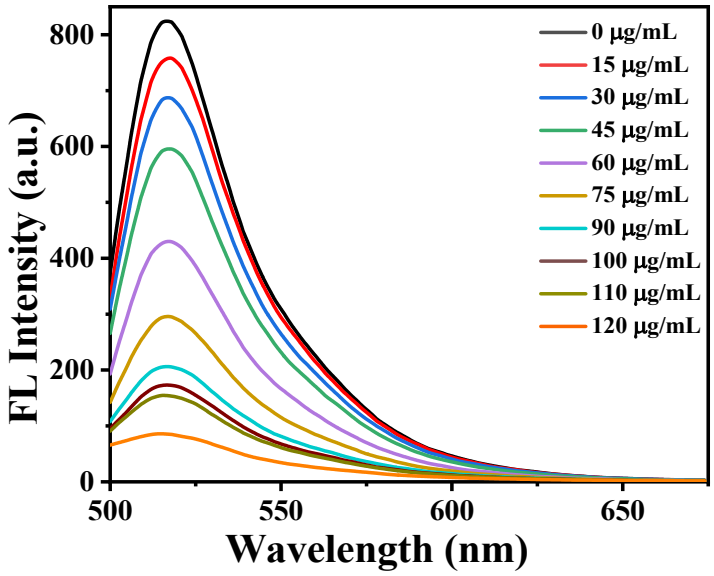


Fig. S2 Variation of the fluorescence intensity of FAM-A20 with UiO-66-NH_2 concentration.

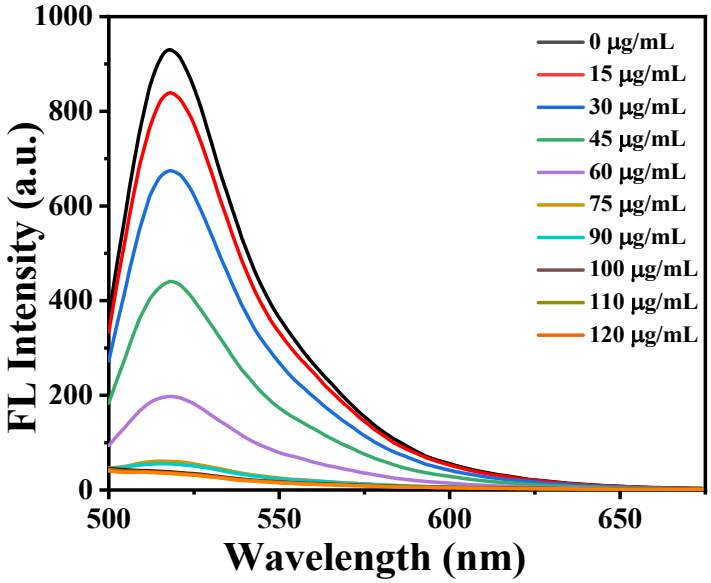


Fig. S3 Variation of the fluorescence intensity of FAM-T20 with UiO-66-NH_2 concentration.

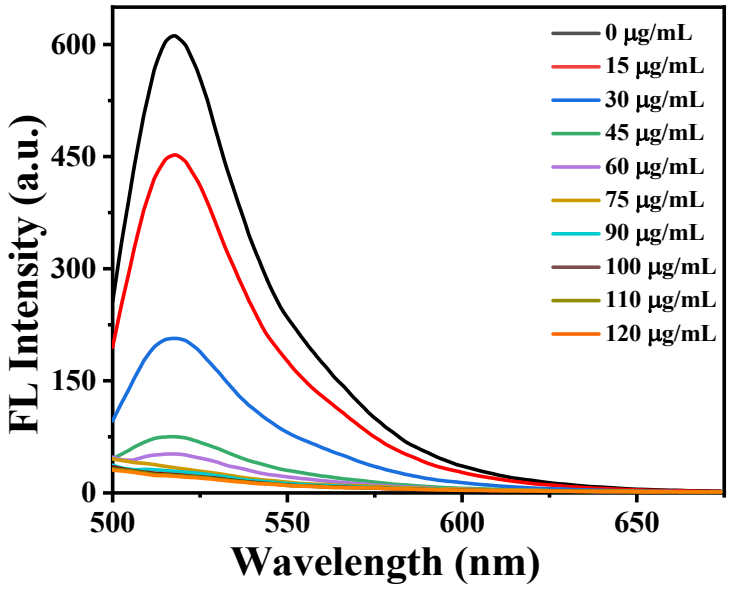


Fig. S4 Variation of the fluorescence intensity of FAM-C20 with UiO-66-NH_2 concentration.

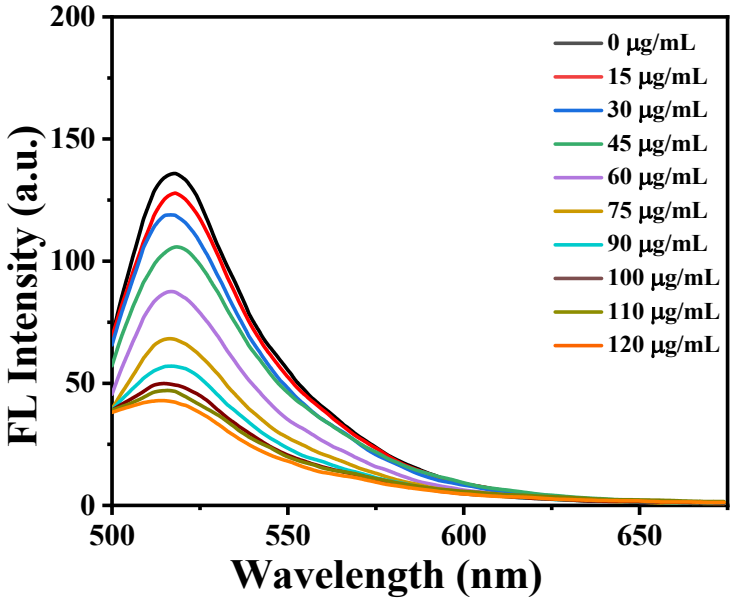


Fig. S5 Variation of the fluorescence intensity of FAM-G20 with UiO-66-NH_2 concentration.

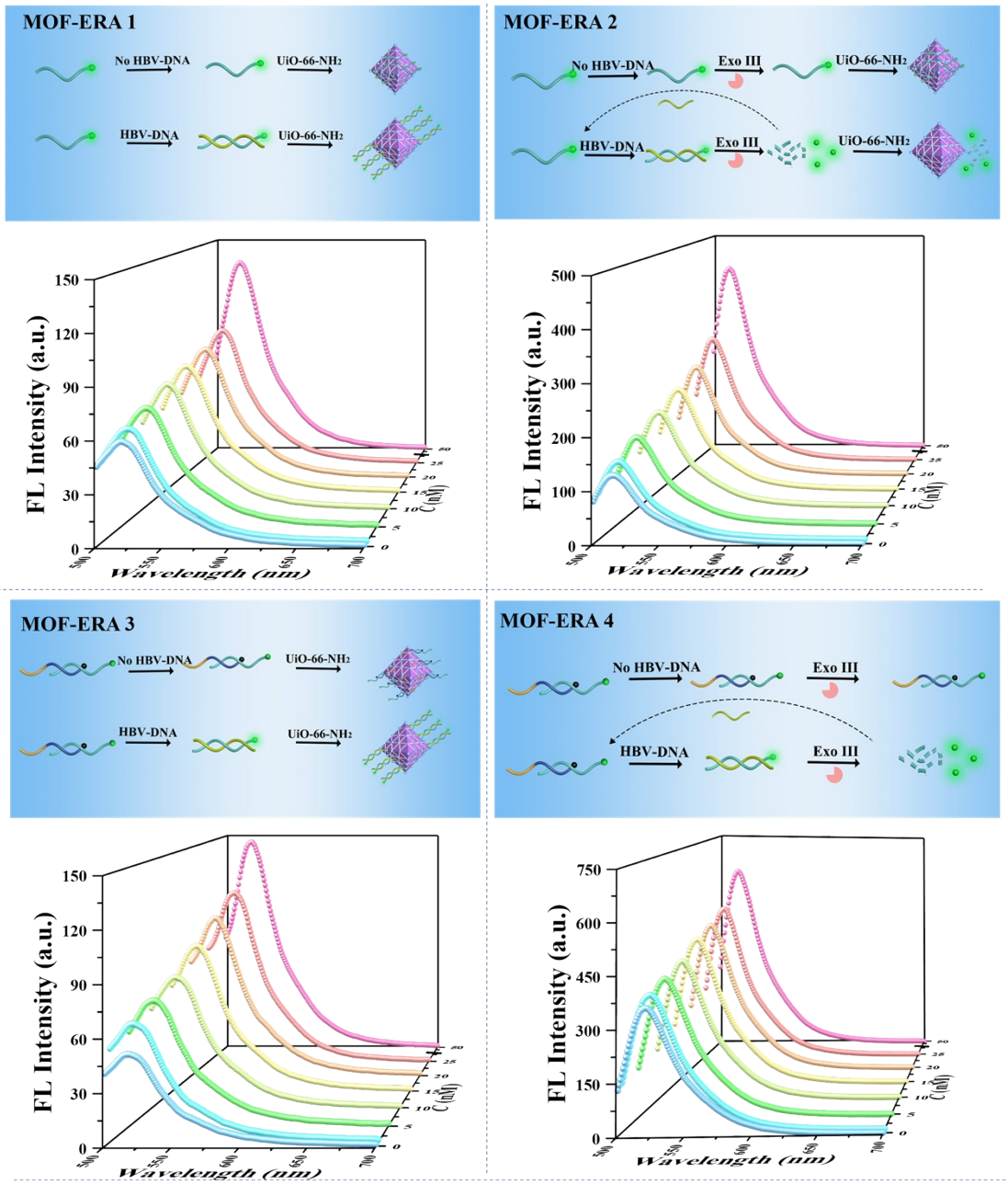


Fig. S6 Schematics of MOF-ERA1, MOF-ERA2, MOF-ERA3 or MOF-ERA4 platform for HBV-DNA detection and their fluorescence response to HBV-DNA with different concentrations.