Supporting Information

Ultrafast ratiometric detection of AFB1 based on fluorescent β-CD@Cu NPs and Pt^{2+} ions

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Materials and instruments. All of the oligonucleotide acids were synthesized by Shanghai Sangon Biotechnology Co., Ltd. (Shanghai, China), and their sequences are shown in Table S1. K_2PtCl_4 was obtained from Maya (Shanghai, China). 3-(N-morpholino) propane sulfonic acid (MOPS), ascorbic acid (AA), NaAc, sodium hydroxide (NaOH), $Cu(Ac)_2$, and other used metal salts were purchased from Sinopharm Chemical Reagent Co., Ltd. (Shanghai, China). All of the other chemicals were analytical grade. The water used in all experiments was ultrapure water.

Transmission electron microscopy (TEM) images were obtained on a JEOL JEM-2100 transmission electron microscope (Hitachi, Japan) with a working voltage of 200 kV. The UV–visible absorption was measured by a UV-1800 spectrophotometer (Shimadzu Co., Japan). Dynamic light scattering (DLS) analysis were carried out on a NanoBrook Omni apparatus (Brookhaven Instruments, USA). All fluorescence measurements were performed using a fluorescence spectrophotometer F97Pro (Shanghai Lengguang Technology, China) with quartz cuvette. Fluorescence lifetime measurements were measured using a FLS980 fluorescence spectrometer (Edinburgh Instruments, UK). High resolution transmission electron microscope (HRTEM) images, selective area electron diffraction (SAED) pattern and energy dispersive X-ray spectroscopy (EDS) spectrum of β-CD@Cu NPs were obtained on a Tecnai G20

microscope (FEI, USA). Fourier transform-infrared spectra (FT-IR) were obtained by using a Nicolet 6700 infrared spectrophotometer (Thermo, U.S.)

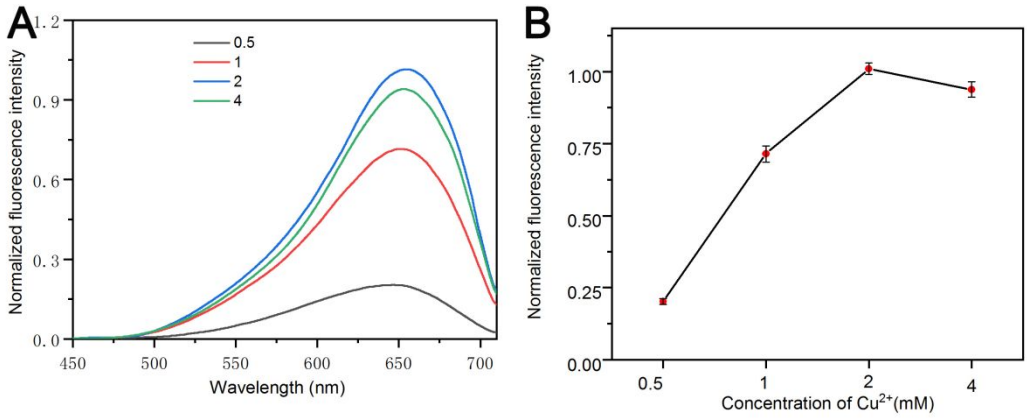

Figure S1. (A, B) The effect of Cu^{2+} concentration on the fluorescence of β-CD@Cu NPs.

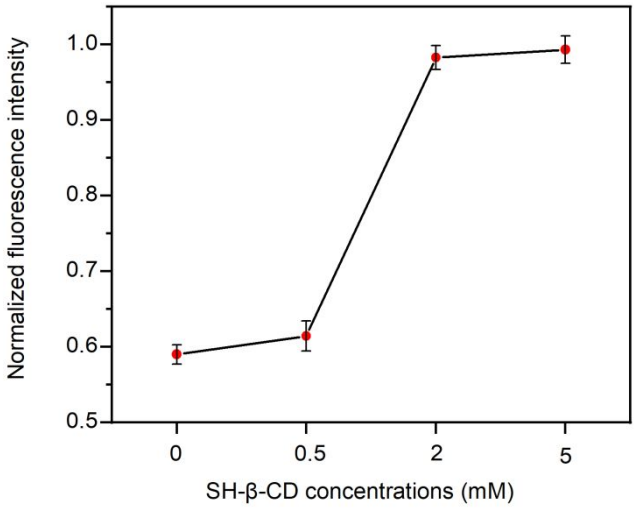

Figure S2. Fluorescence of β-CD@Cu NPs under different SH-β-CD concentrations.

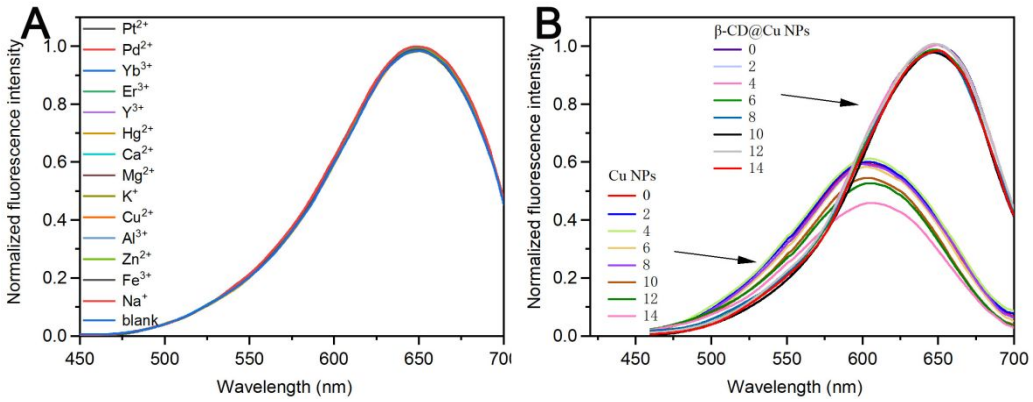

Figure S3. (A) Effect of different metal ions on the fluorescence of β-CD@Cu NPs; (B) Fluorescence spectra of Cu NPs and β-CD@Cu NP at different days. ($C_{\text{Metal ion concentration}}$ = 1 mM.)

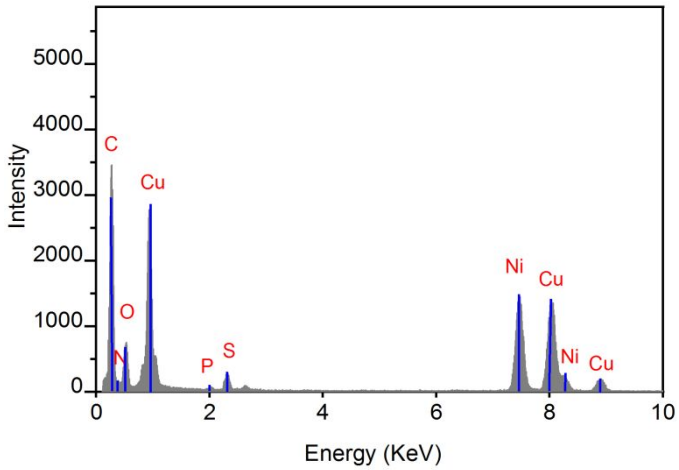

Figure S4. EDS spectrum of β-CD@Cu NPs.

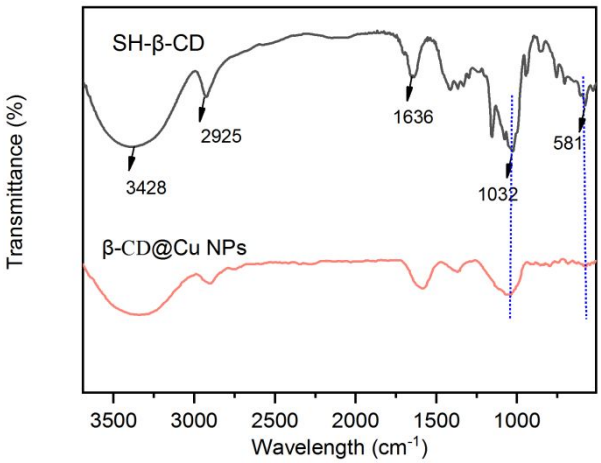

Figure S5. FT-IR spectra of SH-β-CD and β-CD@Cu NPs.

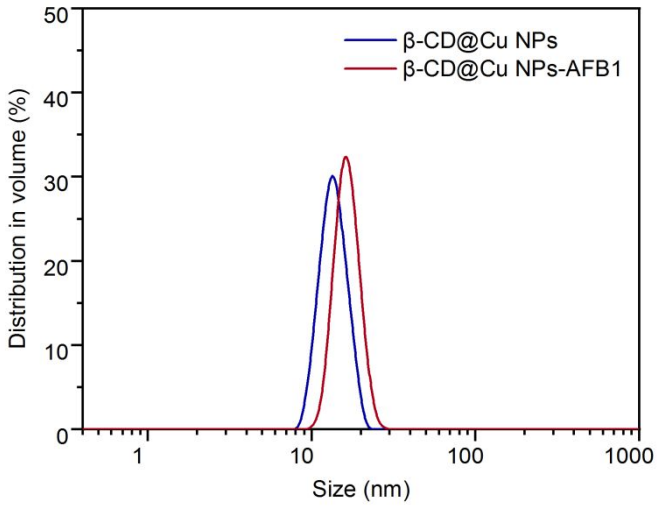

Figure S6. The particle size of β-CD@Cu NPs before and after the addition of AFB1

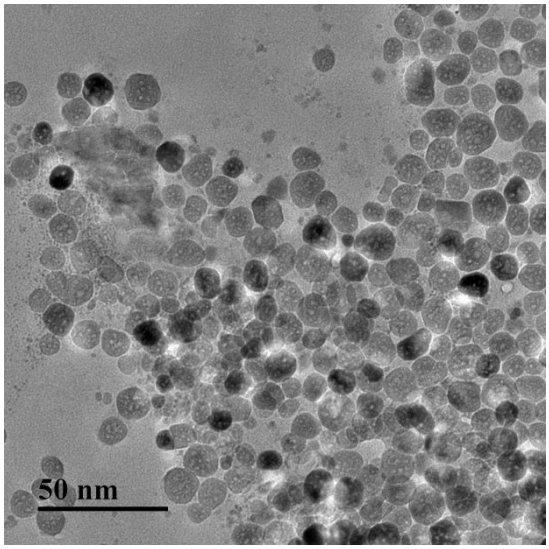

Figure S7. TEM image of β-CD@Cu NPs-AFB1.

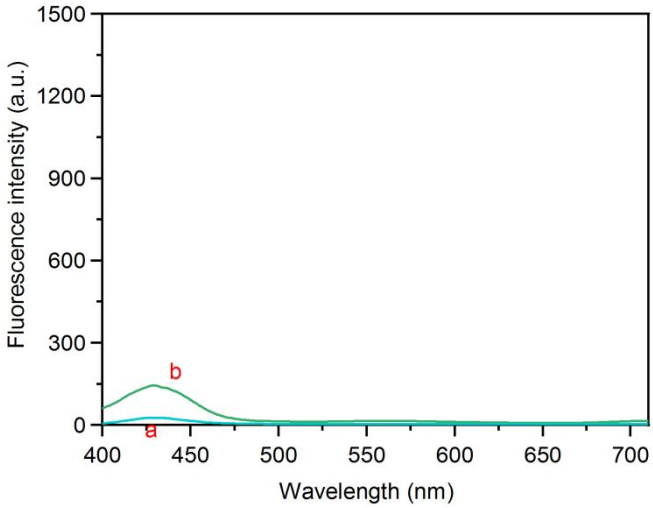

Figure S8. Fluorescence spectra of AFB1 (a) and mixtures (b) of AFB1 and β-CD.

(C_{AFB1} = 10 ng/mL)

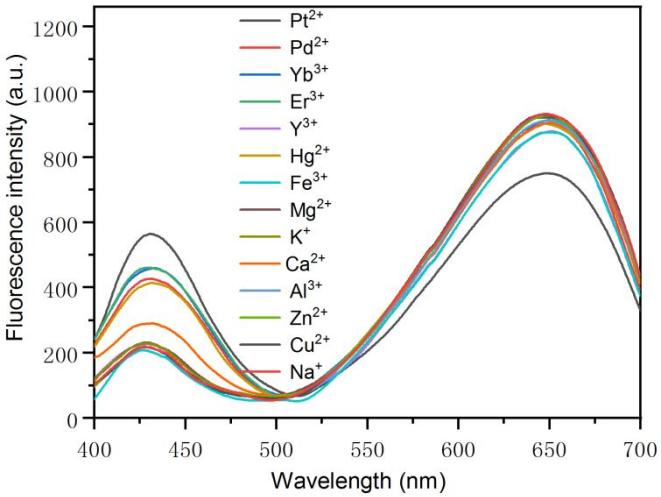

Figure S9. Enhancement effect of various metal ions on the fluorescence of AFB1 in the β-CD@Cu NPs-M-AFB1 system. (C_{AFB1} = 10 ng/mL)

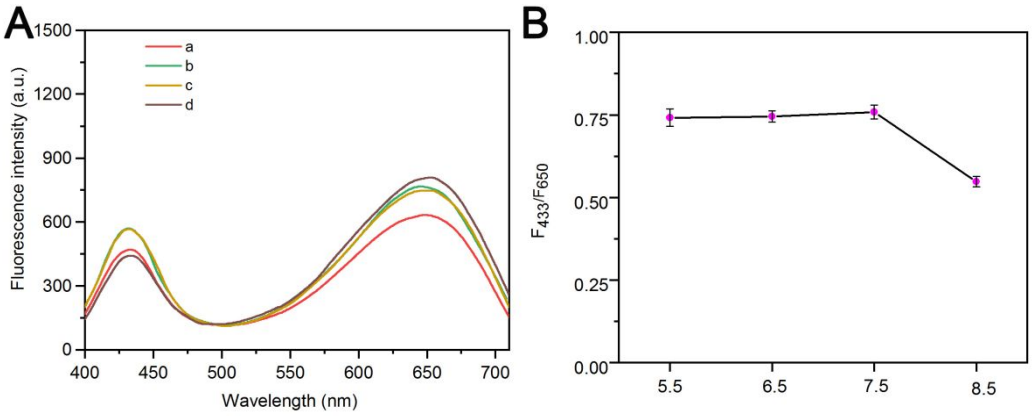

Figure S10. (A, B) Fluorescence changes of β-CD@Cu NPs-AFB1 at different pH conditions.

F_{650} is the fluorescence values of β-CD@Cu NPs-AFB1 at 650 nm and 433 nm under different pH conditions, respectively. The curves from a to d represent the change in fluorescence spectra from pH 5.5 to 8.5. The pH was controlled by mixing β-CD@Cu NPs with AFB1 solutions at the same pH conditions. (C_{AFB1} = 10 ng/mL)

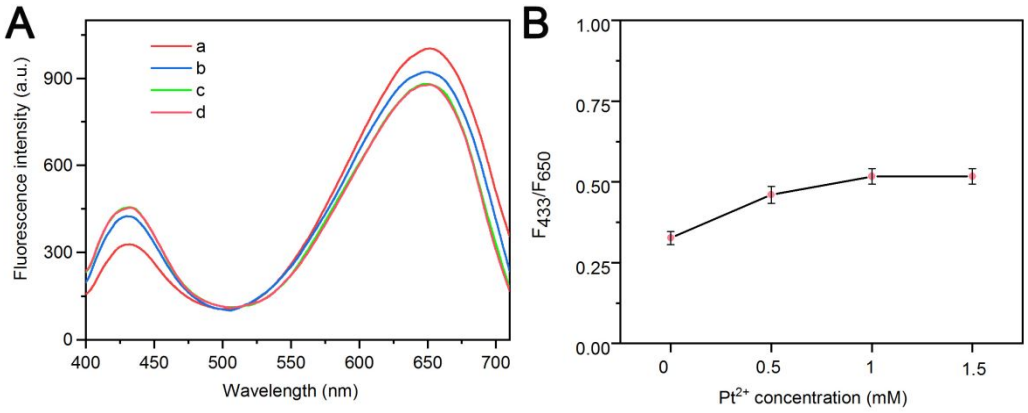

Figure S11. (A, B) Effect of different concentrations of Pt^{2+} on the β-CD@Cu NPs system.

Curves a, b, c, and d represent the fluorescence spectra of β-CD@Cu NPs-AFB1-Pt^{2+}. From a to d, the Pt^{2+} concentrations are 0, 0.5, 1, and 1.5 mM, respectively. (C_{AFB1} = 10 ng/mL)

Table S1. Sequences of DNA templates used for the preparation of β-CD@Cu NPs

Oligonucleotide	Sequences (from 5’ to 3’)
a-DNA	CCTGTCTGCCTAATGTGCGTCGTAAG
b-DNA	CTTACGACGCACAAGGAGATCATGAG
c-DNA	CTCATGATCTCCTTTAGGCAGACAGG

Table S2. Comparison of the proposed sensor with other previously reported fluorescent sensors.

Nanocomposite	Recognition elements	Foodstuff	Liner range (ng/mL)	LODs (ng/mL)	Detection time	Ref
p-Bromophenol-Enhanced Bienzymatic	antibodies	grain	0.000017-3.91	0.000005	40 min	[1]
tungsten disulfide nanosheets	Aptamers	maize	0.001-100	0.0004	60 min	[2]
Mn-ZnS QDs	MIP	non-dairy beverages	0-400	16	12 min	[3]
MIP-membrane	MIP	waste water	14-500	14	60 min	[4]
H_4TCPB-LMOF	MOF	walnut and almond beverages	23-7800	19.97	5 min	[5]
β-CD@Cu NPs	β-CD@Cu NPs-Pt^{2+}	rice	0.03 -18	0.012	1 min	This work

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