Electronic Supplementary Material (ESI) for Analyst.
This journal is © The Royal Society of Chemistry 2019

Electronic Supplementary Information

Semi-conductor quantum dots based ratiometric electrochemical aptasensor for selective and reliable determination of aflatoxin B1†

Chengquan Wang, [ac] Jing Qian, *[b] Keqi An, [b] Xiaoting Lu, [b] and Xingyi Huang *[a]

[a] *School of Food and Biological Engineering, Jiangsu University, Zhenjiang 212013, PR China.*

[b] *School of Chemistry and Chemical Engineering, Jiangsu University, Zhenjiang 212013, PR China.*

[c] *School of Chemical and Biomolecular Engineering, Georgia Institute of Technology, Atlanta, GA, 30332, USA.*

* Corresponding author: Tel.: +86 511 88791800. Fax: +86 511 88791708.

E-mail addresses: qianj@ujs.edu.cn (J. Qian); h_xingyi@163.com (X. Y. Huang)

Preparation of Fe_3O_4 MBs. Briefly, 2 mmol of $FeCl_3 \cdot 6H_2O$ was dissolved in a solution containing 10 mL of EG and 10 mL of DEG by ultrasonication for half an hour, followed by the addition of 20 mmol of sodium acetate and 2 mmol of PEG. After vigorously stirring for 30 min, the mixture was sealed in a Teflon-lined autoclave which was heated at 200 ^oC which was maintained for 3 h. Then it was cooled to room temperature. The Fe_3O_4 nanospheres were separated by a magnet and washed three times with ethanol and water, respectively. Finally, the obtained Fe_3O_4 nanospheres was re-dispersed in 50 mL of ethanol with ultrasonication for 5 min.

Preparation of the CdTe QDs. 10 mL of water including 0.065 g of tellurium powder and 0.05 g of $NaBH_4$ were to form a black mixture under N_2 atmosphere and then stayed for 4 h in an ice bath. After the black color disappeared, the supernatant containing NaHTe was used as the precursor for the preparation of CdTe QDs. 50 mL of water including a 0.1142 g amount of $CdC_{l2}·2.5H_2O$ and 210 μL of MPA were adjusted to 9.0 with 1.0 M NaOH. The freshly prepared NaHTe solution was transferred into the above mixture (final molar ratio: Cd/Te/MPA=1:1:2.5) under N_2 atmosphere. The CdTe precursor was immediately formed and accompanied by a color change from colorless to orange. After being stirred for 20 min at room temperature, the mixture was refluxed for 12 h. The crude CdTe QD solution was purified by ultrafiltration to remove excessive thiols, free cadmium ions, and byproducts.

Preparation of the PbS QDs. Firstly, 280 mg $PbCl_2$ were mixed with 10 mL OLA in a 100 mL of three-neck flask and heated to 90 ^oC to form a homogeneous $PbCl_2$-OLA suspension under a nitrogen atmosphere by magnetic stirring. Secondly, a stock solution of 16 mg Sulfur, dissolved in 6 mL of OLA, was heated to 80 °C for 30 min and cooled to room temperature. Then, 6 mL of the S stock solution was quickly injected into the $PbCl_2$-OLA suspension under vigorous stirring for 10 min at 90 ^oC and then quenched by 10 mL cold hexane. The purification of PbS QDs can be operated with ethanol by repeated centrifuging for 15 min at 3000 rpm to precipitate the excess $PbCl_2$ precursor. The as-synthesized PbS QDs coated with the OLA were dissolved in a minimum amount of *n*-hexane and excess MPA was added until the solution became cloudy. The mixture was then shaken for 60 min with sonication and gradually became turbid. Repeat the centrifugations process in *n*-hexane and ethanol for twice to remove free MPA from the mixture. Finally, the resultant PbS QDs coated with MPA was obtained and dissolved in 20 mL of saturated $NaHCO_3$ solution in water for the further use.

Preparation of the SiO_2 NPs. 100 mL of ethanol mixed by 3.5 mL of H_2O and 2.5 mL of $NH_3 \cdot H_2O$ (25 wt%) were added into a 250 mL flask and heated gradually to 55 °C under constant vigorous stirring. 2.5 mL of tetraethoxysilane (TEOS) and 8 mL of ethanol was mixed and slowly added to the solution quickly. After maintaining solution temperature at 55 °C for 5 h, the colloidal suspension containing 45 nm SiO_2 nanoparticles was obtained. To obtain larger particles, 10 mL of SiO_2 nanoparticles from the above step was mixed with 80 mL of ethanol, 15 mL of H_2O, and 8 mL of $NH_3 \cdot H_2O$ in a 250 mL flask. A mixed solution of 1 mL of TEOS and 10 mL of ethanol was added to the flask dropwise, followed by continuous stirring for 5 h. After purified with ethanol three times. The enlarged SiO_2 nanoparticles were 100 nm in diameter and were stored until used.

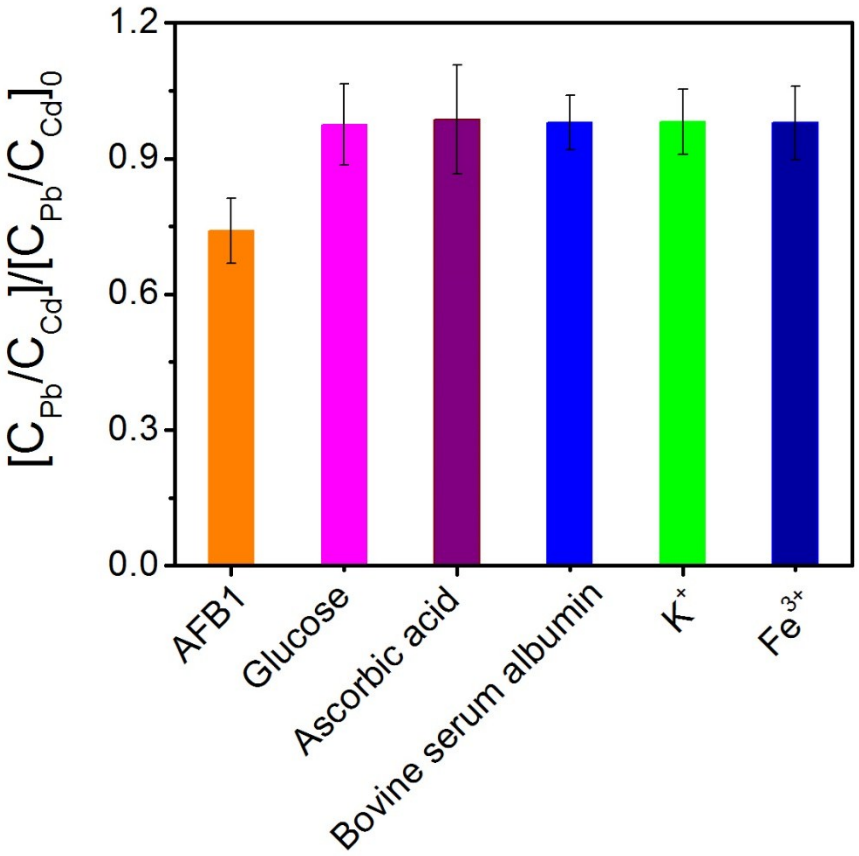

Fig. S1 The response of the aptasensor after incubation with AFB1, glucose, ascorbic acid, and bovine serum albumin. (The concentrations for AFB1 is 50 pg/mL and for glucose, bovine serum albumin, ascorbic acid, K^+, and Fe^{3+} is 10 ng/mL)