Supplementary Information for

A Positively Charged QDs-based FRET Probe for Micrococcal Nuclease Detection

Ting Qiu[†], Dan Zhao[‡], Guohua Zhou[†], Yuan Liang[†], Zhike He[†], Zhihong Liu[†], Xiaoniu Peng, Li Zhou.*

Synthesis of hydrophobic CdSe/ZnS QDs

CdSe QDs: CdSe QDs were synthesized according to the scheme reported with minor modifications. Briefly, CdO (0.0254 g) and stearic acid (0.2280 g) were heated to 150 °C to dissolve CdO under Ar flow. After the mixture was allowed to cool down to room temperature, trioctylphosphine oxide (TOPO, 3.88 g) and hexadecylamine (3.88 g) were added, and the mixture was heated to 310 °C under Ar flow. At the same time, the Se solution (0.158 g) in tributylphosphine (TBP, 0.476 g) and dioctylamine (3.362 g) was swiftly injected into the reaction flask. The reaction was keeping on 3 min and then the heating mantle was removed immediately. After purification by precipitation, centrifugation and decantation, the vacuum-dried CdSe QDs were redispersed in hexane and kept in the dark.

CdSe/ZnS core/shell QDs: CdSe/ZnS core/shell QDs were synthesized as follows: a precursor of S was prepared by dissolving S (0.0192 g) into octadecene (ODE, 4 mL) in a flask at 220 °C, and kept for at least 30 min. The precursor of Zn was obtained by mixing $Zn(Ac)_2$ (0.0556g), TOPO (1.94 g), hexadecylamine (1.94 g), and ODE (4 mL) in another flask, heated to 220 °C, and kept for at least 30 min. These two precursor solutions were transferred in dropwise to the vigorously stirring reaction mixture of CdSe QDs via a funnel over a period of 30 min. Then the mixture was cooled to 90 °C, and kept for an hour. Finally the mixture was cooled down to room temperature and the product was recovered by precipitating with acetone and redispersed in hexane.

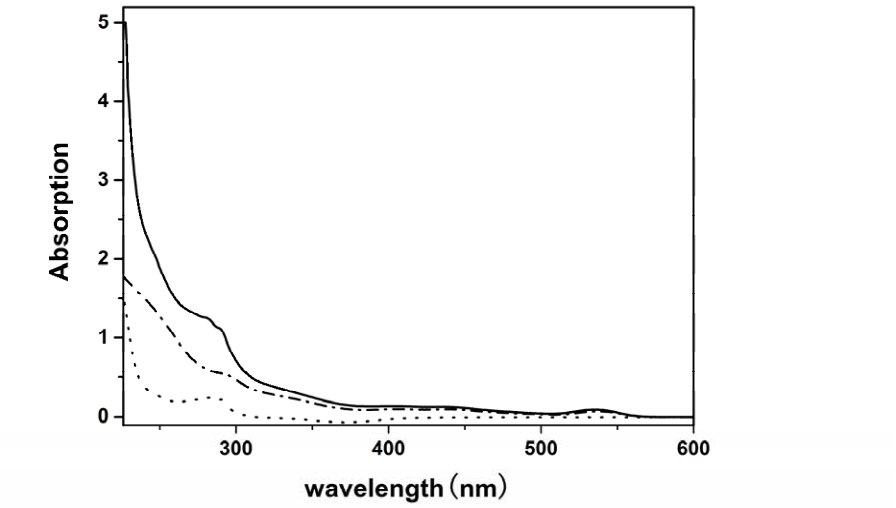

Fig. S1 UV-vis absorption spectra of the Lyz-QDs complex (solid line), pure Lyz (dotted line) and MAA-QDs (solid-dot line), the concentration of QDs was 50 nM for both Lyz-QDs and MAA-QDs.

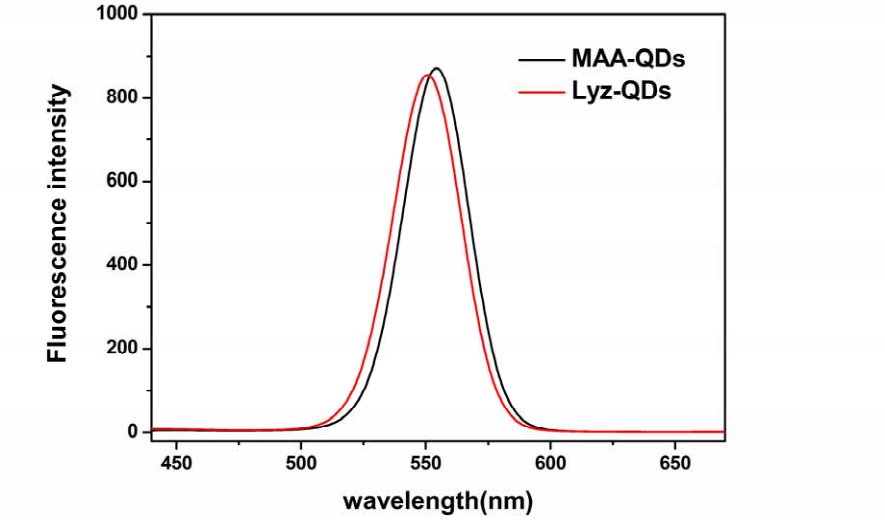

Fig. S2 The fluorescence spectra of MAA-QDs and Lyz-QDs. The concentration of MAA-QDs and Lyz-QDs was 100 nM.

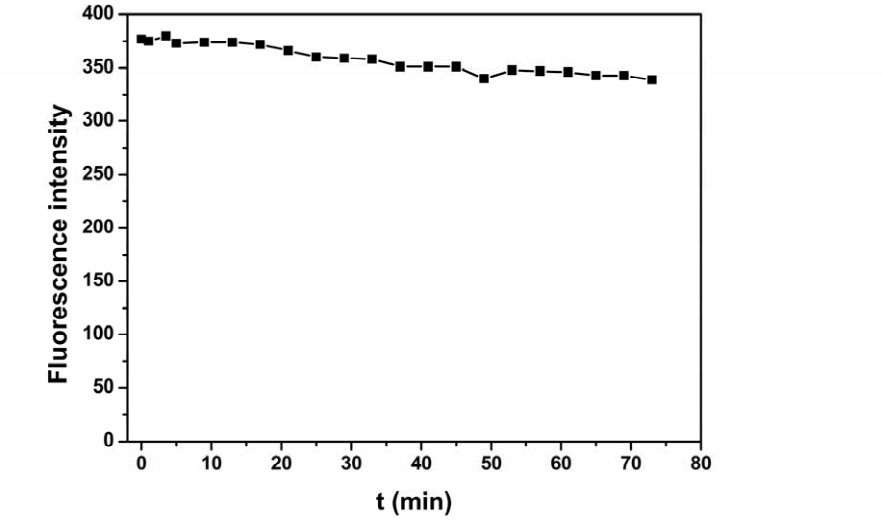

Fig. S3 The fluorescence intensity of Lyz-QDs at different time. The concentration of Lyz-QDs was 50 nM.

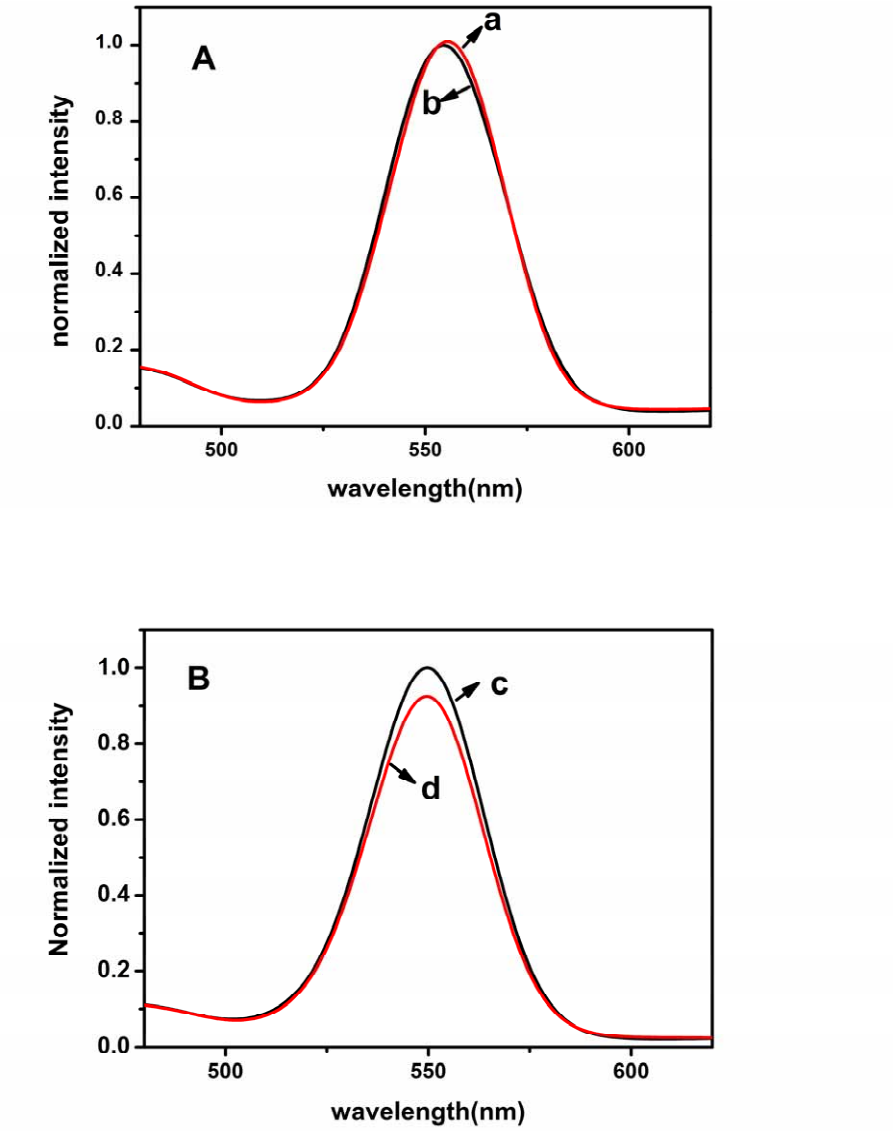

Fig. S4 A) Emission spectra of MAA-QDs excited at 388 nm (a) and in the presence of 62 nM ROX-ssDNA (b); B) Emission spectra of SA-QDs excited at 388 nm (c) and in the presence of 62 nM ROX-ssDNA (d).[QD] = 50 nM.

The detail cultivation and treatment of *Staphylococcus aureus*

Staphylococcus aureus sample (S. *aureus*, CCTCC AB910393) was provided by the Chinese Center for Type Culture Collections, Wuhan University, P. R. China. S. *aureus* was grown in a peptone culture medium which contains 10 g peptone, 5 g yeast extract and 5 g NaCl per 1 L (pH 7.0). The culture medium was sterilized in high-pressure steam for 30 min at 120 ºC before use. Then the culture mediums containing S. *aureus* were centrifuged at 5000 rpm for 5 min, and the supernatant was collected and boiled for 10 min at 95 ºC. Supernatant (20 μL) was added into the nuclease digestion reaction buffer (500 μL) which contains the biosensor, then fluorescent spectra of Lyz-QDs was recorded after the mixed solution was incubated for 30 min at 37 ºC.

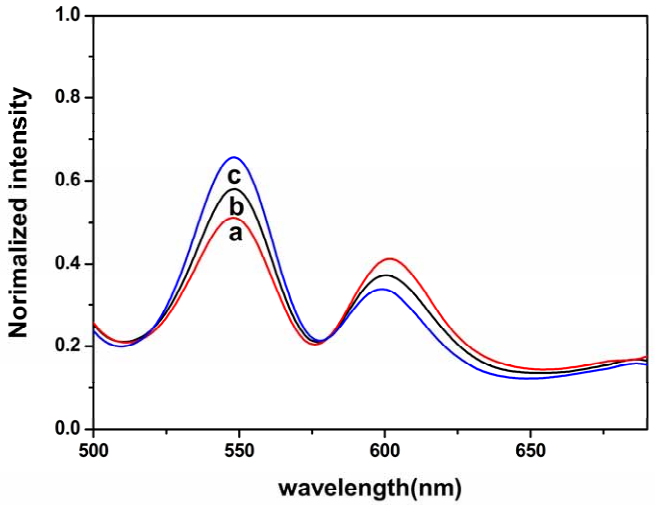

Fig. S5 Normalized fluorescent spectra of Lyz-QDs with ROX-ssDNA in real samples: (a) the *S. aureus* culture medium without incubating, (b) the *S. aureus* culture medium incubated for 4 h and (c) the *S. aureus* culture medium incubated for 8 h. The concentration of Lyz-QDs is 50 nM and that of ROX-ssDNA is 62 nM.