Supplementary Material

One-pot synthesis of stable and functional hydrophilic $CsPbBr_3$ perovskite quantum dots for "turn-on" fluorescence detection of *Mycobacterium tuberculosis*

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Note 1. Optimization of conditions of the biosensing platform.

Note 1.1. MoS_2 NSs concentration

To achieve a better analytical performance, we first determined the effect of the MoS_2 NS concentration. MoS_2 NSs solutions with different concentrations were incubated with a $CsPbBr_3$ QD-DNA solution at 1 mg mL^{-1}. As shown in Fig. S5a, the FL intensity ratios, F/F0 (where F and F0 referred to the FL intensity of $CsPbBr_3$ QDs-DNA in the presence and absence of MoS_2 NSs, respectively), decreased gradually with increasing concentrations of MoS_2 NSs from 0.2 to 2.0 μg mL^{-1}, but increased when the concentration of MoS_2 NSs exceeded 2.0 μg mL^{-1}. This reversed phenomenon can be attributed to the aggregation of MoS_2 NSs. Therefore, 2.0 μg mL^{-1} was chosen for DNA detection.

Note 1.2. Adsorption and hybridization times

The FL intensity ratio, F/F0, corresponding to the adsorption time between ssDNA and MoS_2 NSs from 5 to 60 min is shown in Fig. S5b. There was a significant decrease in the fluorescence of $CsPbBr_3$ QDs-DNA with increasing adsorption time, and it reached a plateau at 40 min. To optimize the hybridization time, the $CsPbBr_3$ QDs-DNA solution was incubated with the target sequence for different times prior to the addition of MoS_2 NSs (Fig. S5c). The FL intensity ratio, F/F0 (where F and F0 refer to the FL intensity of the $CsPbBr_3$ QDs-DNA/MoS_2 NSs in the presence and absence of the target sequence, respectively), gradually increased with increasing incubation time and remained stable for approximately 30 min. Therefore, adsorption and hybridization times of 40 and 30 min, respectively, were used to detect the target sequence.

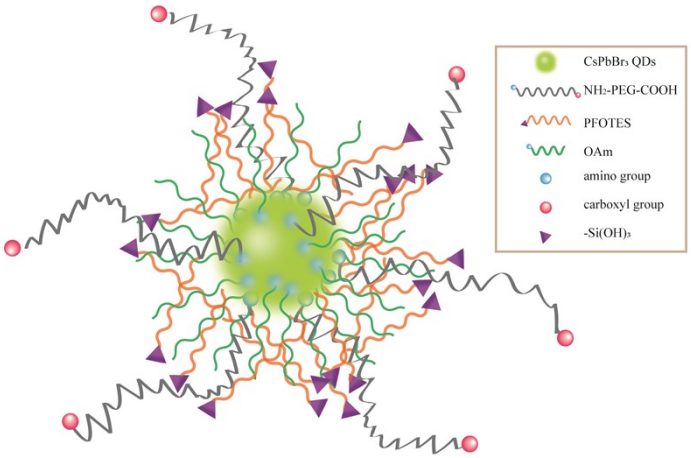

Fig. S1 Schematic diagram of the synergy of NH_2-PEG-COOH, PFOTES and OAm on $CsPbBr_3$-COOH QDs.

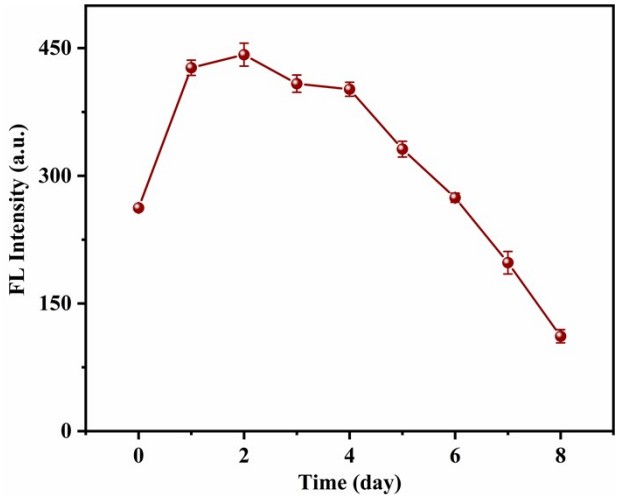

Fig. S2 The stability of FL intensity of OAm/PEG-$CsPbBr_3$ QDs in aqueous solution.

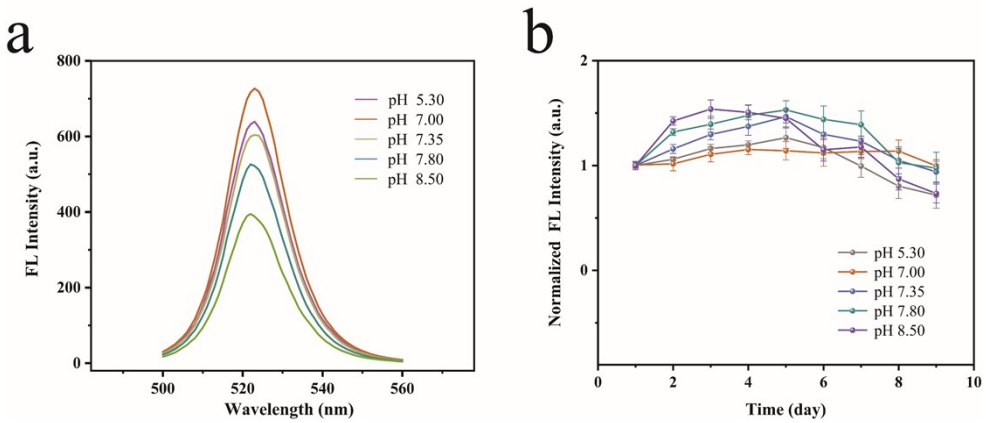

Fig. S3 The stability of $CsPbBr_3$-COOH QDs in different pH solutions. (a) Fluorescence emission spectra of $CsPbBr_3$-COOH QDs solution (0.5 mg mL^{-1}) diluted by different pH solutions (pH=5.3, 7.0, 7.35, 7.8, 8.5). (b) The stability of $CsPbBr_3$-COOH QDs solution diluted by different pH solutions.

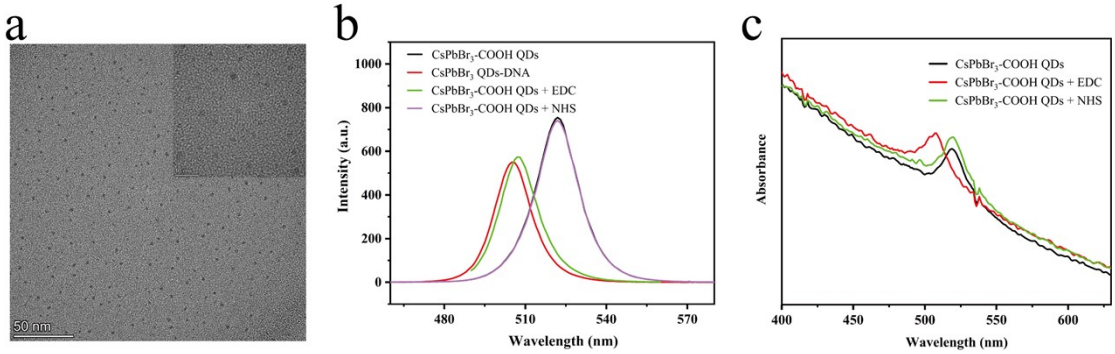

Fig. S4 (a) TEM images of $CsPbBr_3$ QDs-DNA. (b) Fluorescence spectra of $CsPbBr_3$-COOH QDs (black), $CsPbBr_3$ QDs-DNA (red), the mixture of $CsPbBr_3$-COOH QDs and EDC (green) and the mixture of $CsPbBr_3$-COOH QDs and NHS (purple). (c) Absorption spectra of of $CsPbBr_3$-COOH QDs (black), the mixture of $CsPbBr_3$-COOH QDs and EDC (red) and the mixture of $CsPbBr_3$-COOH QDs and NHS (green).

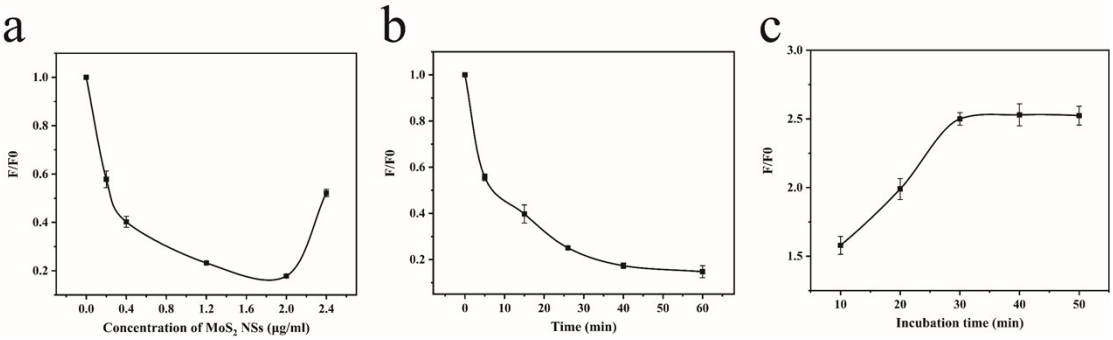

Fig. S5 Optimization of the experimental conditions. (a) The effect of the MoS_2 NS concentrations with the final concentration of $CsPbBr_3$ QDs-DNA fixed at 1.0 mg mL^{-1}. (b) The effect of adsorption time. (c) The effect of hybridization time between $CsPbBr_3$ QDs-DNA and target. $CsPbBr_3$ QDs-DNA: 1.0 mg mL^{-1}; MoS_2 NSs: 2.0 μg mL^{-1}. Error bars represented the standard deviation of three measurements.

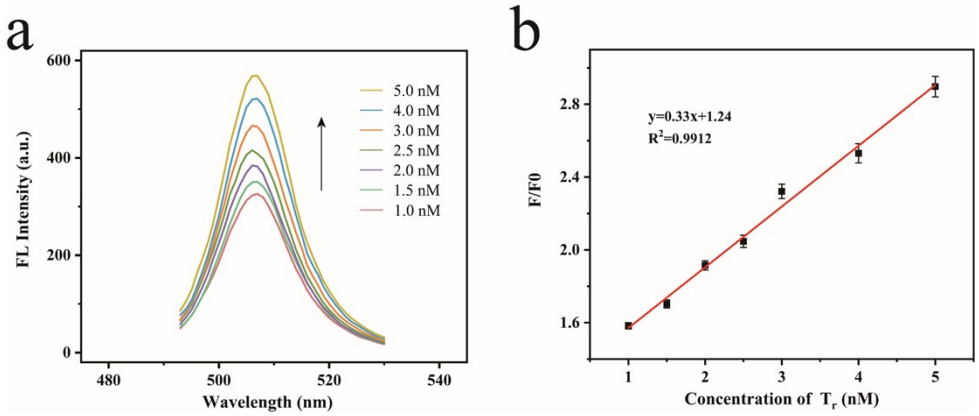

Fig. S6 Linear response of FL intensity to T_r concentrations. (a) Fluorescence spectra of $CsPbBr_3$ QDs-DNA2/MoS_2 NSs biosensing platform in the presence of T_r from 1.0 to 5.0 nM. (b) Calibration curves for T_r detection.

Table S1. DNA sequences for experiments.

Oligonucleotides	Sequence (5' → 3')
ssDNA	NH_2-C_6-GTCATTGCGTCATTTCCTTCGATT
Target: Mtb DNA	AATCGAAGGAAATGACGCAATGAC
ssDNA 2	NH_2-C_6-GCGCCGACTGTTGGCGCTGGGGCC
T_r	GGCCCCAGCGCCAACAGTCGGCGC
M2: two-base mismatched target	AATCGAAGGAAGTGACGCACTGAC
M4: four-base mismatched target	ACTCGAAGGTAGTGACGCACTGAC
R: random sequence	GTGTCGTCTTCAGAATACCATGCT