Electronic Supplementary Material (ESI) for Analytical Methods.

Supplemental Information

A strategy to facilitate the assemble of DNA and upconversion nanoparticles for biosensor construction

Yuping Han, Lin Shen, Zhen Li* and Zhi ong Liu*

Key Laboratory of Analytical Chemistry for Biology and Medicine (Ministry of Education), College of Chemistry and Molecular Sciences, Wuhan University, Wuhan 430072, China

*Corresponding author:

Zhen Li

E-mail: zhenli@whu.edu.cn;

Zhihong Liu

E-mail: zhhliu@whu.edu.cn

Tel: 86-27-87217886;

Fax: 86-27-68754067.

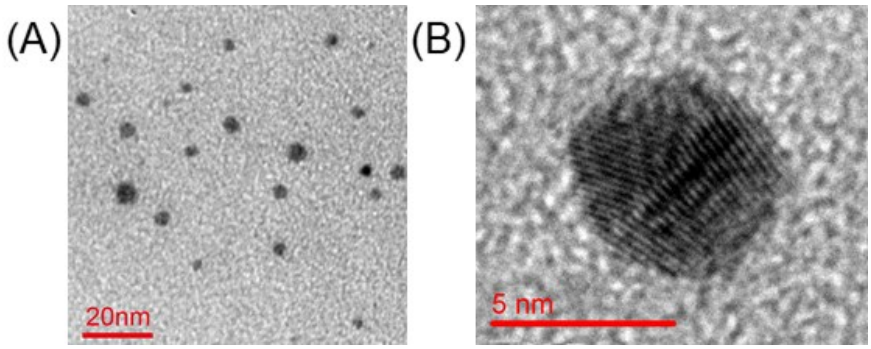

Fig. S1 (A) TEM and (B) HRTEM image of the DNA-AgNPs.

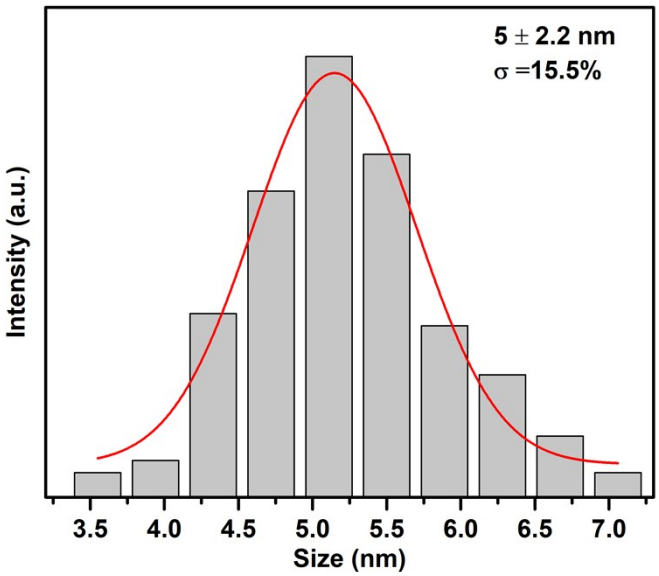

Fig. S2 Particle size distribution histograms of DNA-AgNPs

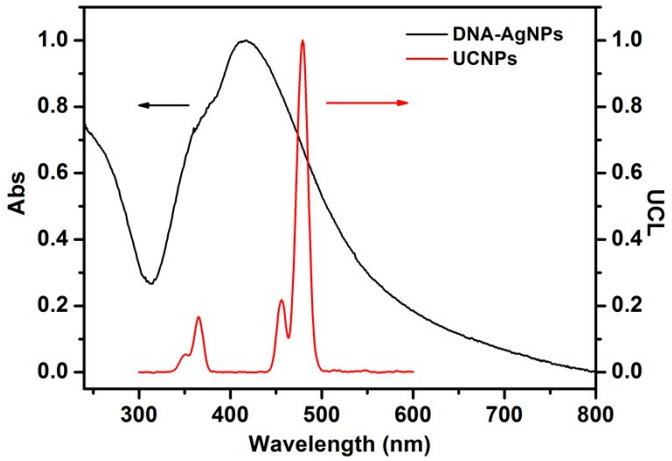

Fig. S3 Normalized UCL spectrum of the UCNPs@PDA (line red) and UV-vis absorption spectrum of Apt-AgNPs (line black).

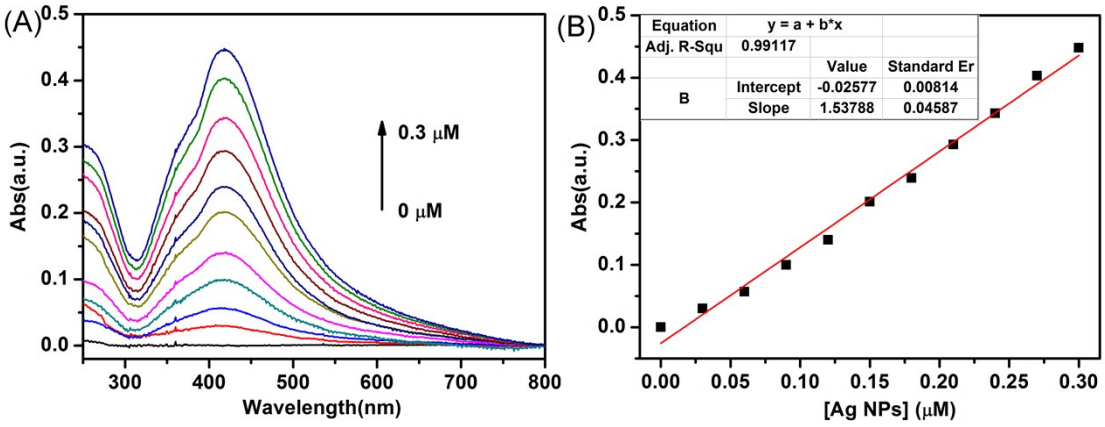

Fig. S4 (A) UV-vis spectrum of Apt-AgNPs at various concentrations (0-0.3 μM). (B) The plot of absorbance at 420 nm against the concentration of DNA-AgNPs.

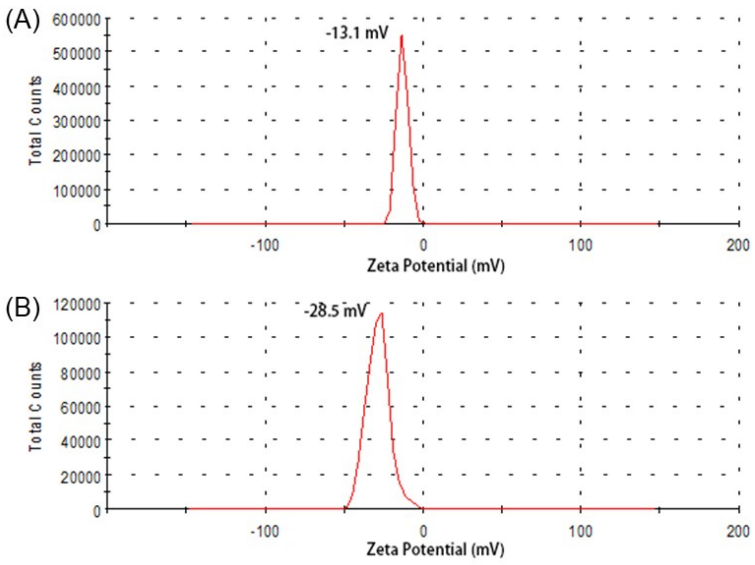

Fig. S5 Zeta potentials of (A) UCNPs@PDA and (B) DNA-AgNPs.

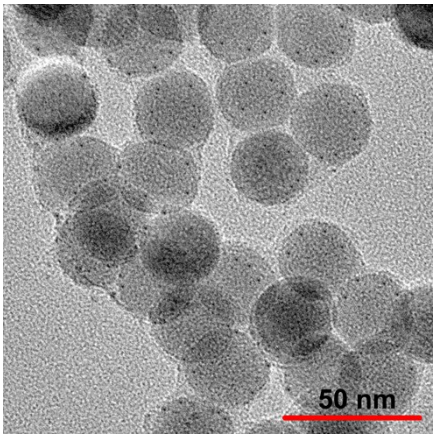

Fig. S6 TEM image of UCNPs@PDA-AgNPs.

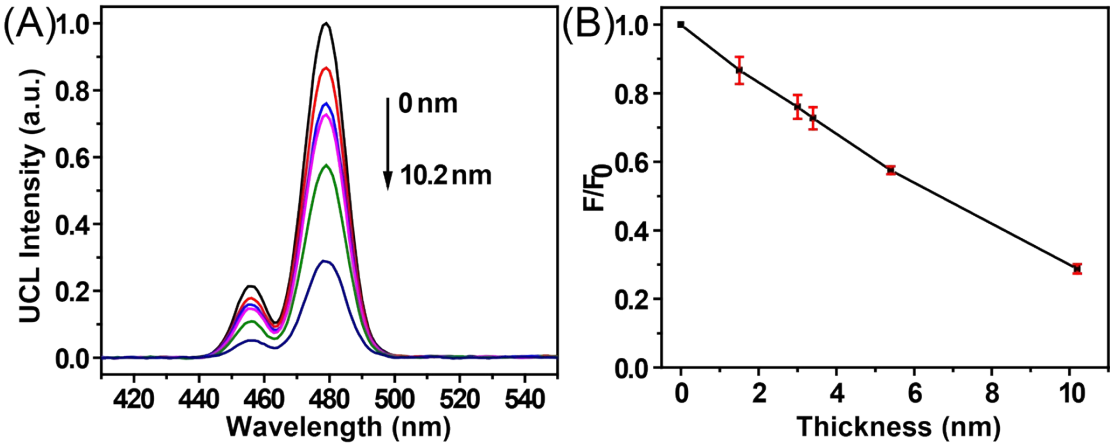

Fig. S7 (A) Emission of UCNPs@PDA (0.2 mg/mL) in the different shell thickness (0-10.2 nm) in Tris-HNO_3 buffer (10 mM, 100 mM $NaNO_3$, pH 7.4) and (B) Shell thickness dependence UCL of the UCNPs@PDA.

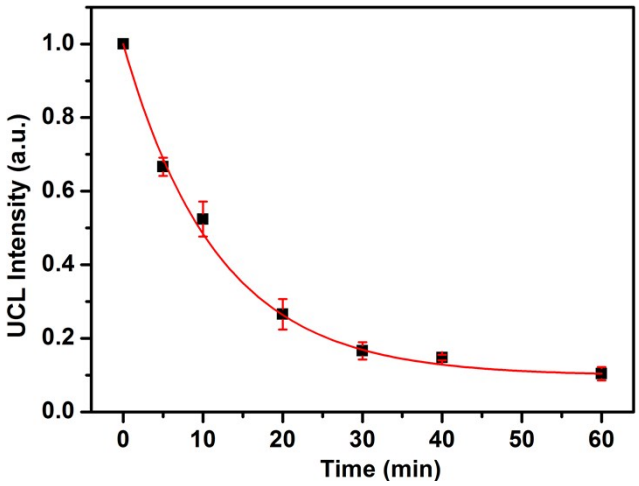

Fig. S8 Time dependence of the UCL quenching of 0.2 mg/mL UCNPs@PDA by 0.25 μM DNA-AgNPs.

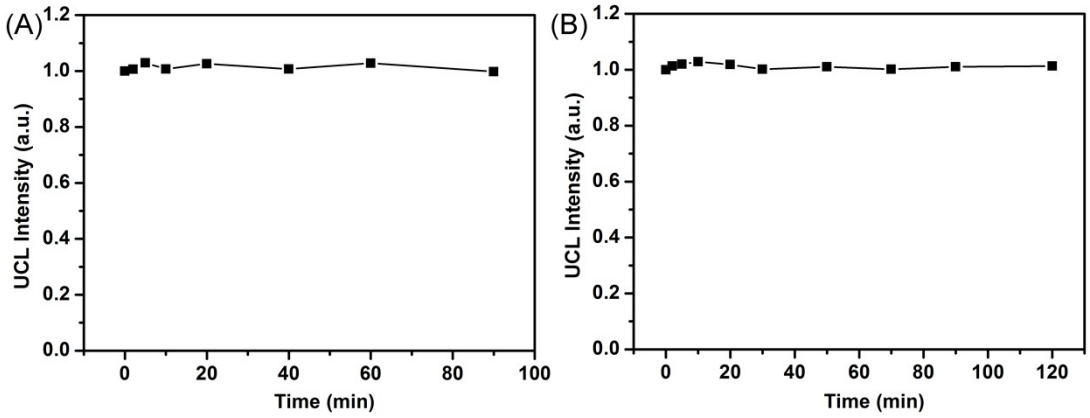

Fig. S9 (A) Normalized UCL emission intensity of the biosensor incubated at 37°C for different times. (B) Photostability of the biosensor under continuous illumination by 980 nm laser.

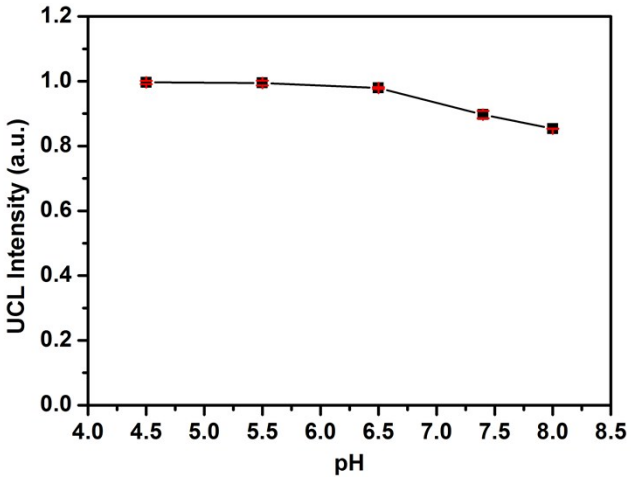

Fig. S10 Normalized UCL emission intensity of the biosensor incubated at different pH values.

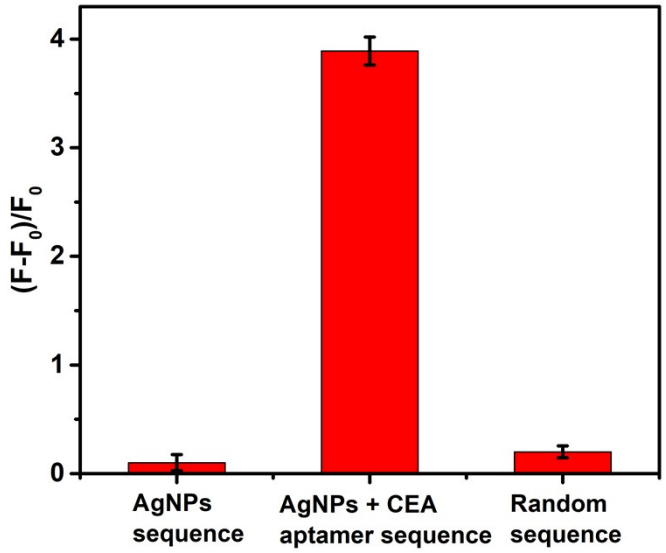

Fig.S11 Relative luminescence intensity ($(F-F_0)/F_0$, where F and F_0 represent the emission intensity of biosensor in the presence and absence of CEA, respectively) of the biosensor in the presence of different DNA sequences with the same amounts of CEA (200 ng/mL). All experiments were performed in Tris-HNO_3 buffer (10 mM, 100 mM $NaNO_3$, pH 7.4).

Table S1. Analytical results of the determination of CEA in five diluted human serum samples by the biosensor

Sample	Measured (ng/mL)	Added (ng/mL)	Found (ng/mL)	Recovery	RSD (n=3)
1	0.48	100	97.14	96.7%	2.5%
2	0.93	100	99.50	98.6%	3.7%
3	2.30	100	100.64	98.4%	3.2%
4	4.62	100	105.13	100.5%	4.5%
5	8.56	100	113.83	104.8%	1.9%

Samples 1-5 were human serum.