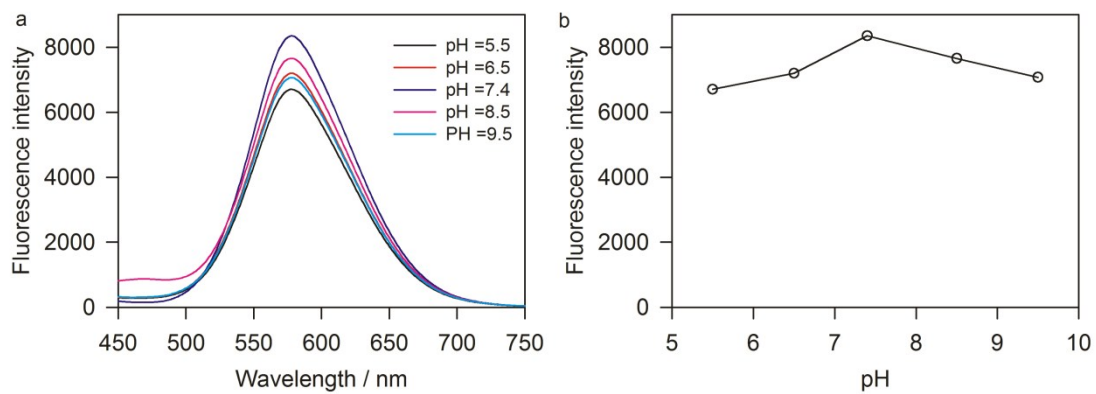


**Au nanoclusters-embedded chitosan nanocapsules as labels for  
ultrasensitive fluorescent immunoassay of *Escherichia coli*  
O157:H7**

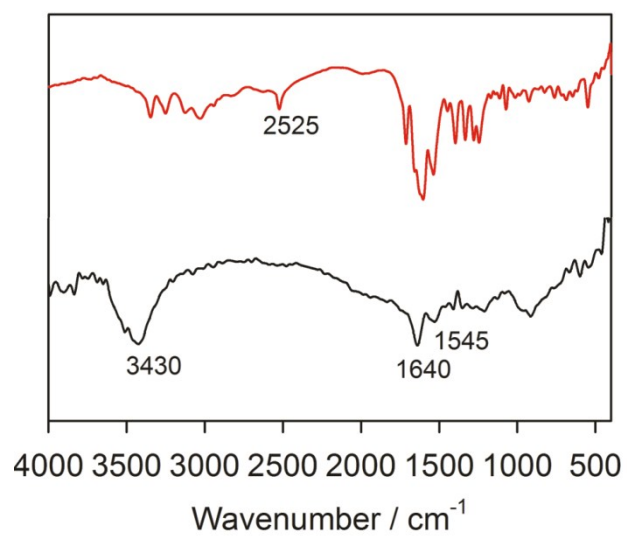
Chang Cheng, Lu Yang, Miao Zhong, Wenfang Deng,\* Yueming Tan,\* Qingji Xie and  
Shouzhuo Yao

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of Education of China), College of Chemistry and Chemical Engineering, Hunan Normal  
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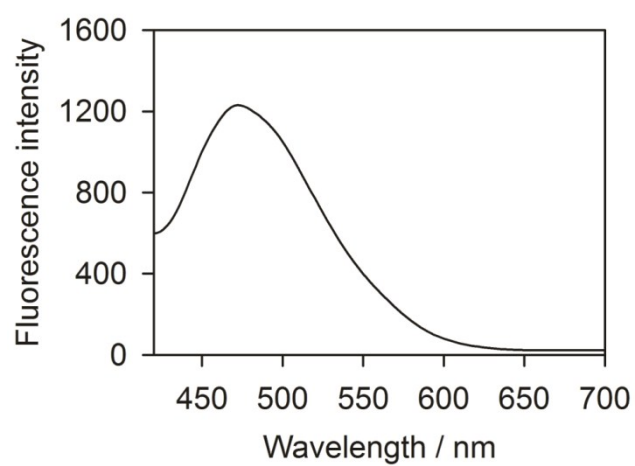
Email: dandy3-3@163.com (W. Deng); tanyueming0813@126.com (Y. Tan)



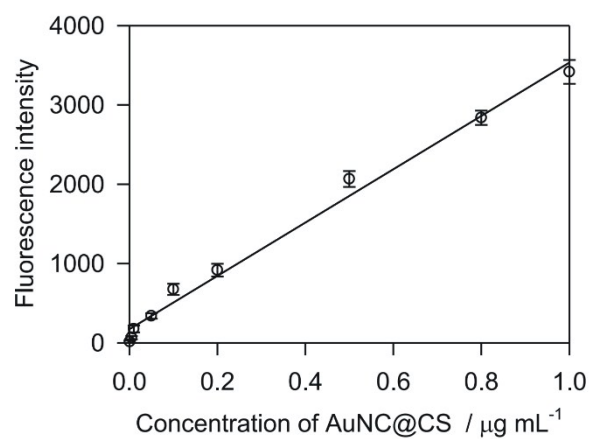
**Fig. S1** (a) Fluorescence spectra of AuNCs in aqueous solutions of different pH. (b) Effect of pH on the fluorescence intensity of AuNCs at 572 nm.



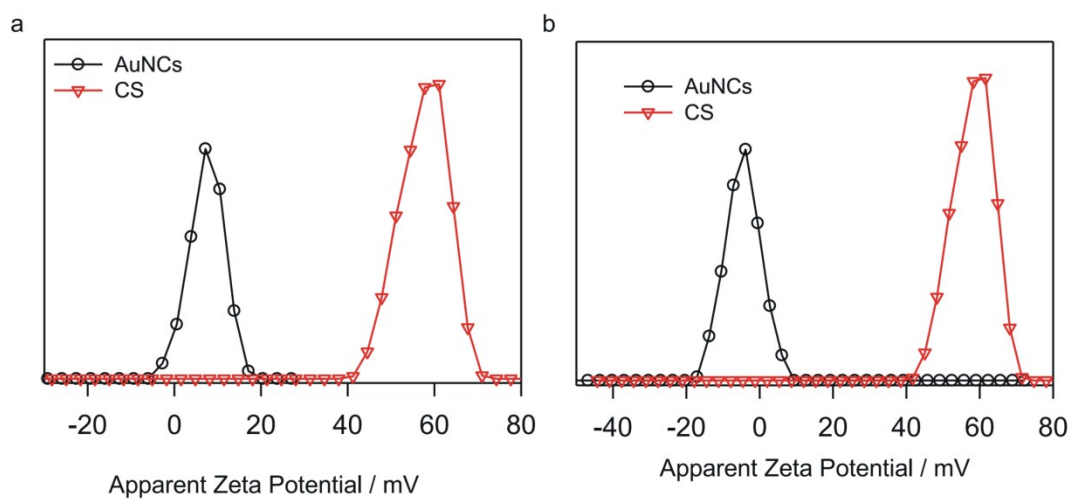
**Fig. S2** FT-IR spectra of reduced glutathione (red line) and AuNCs (black line).



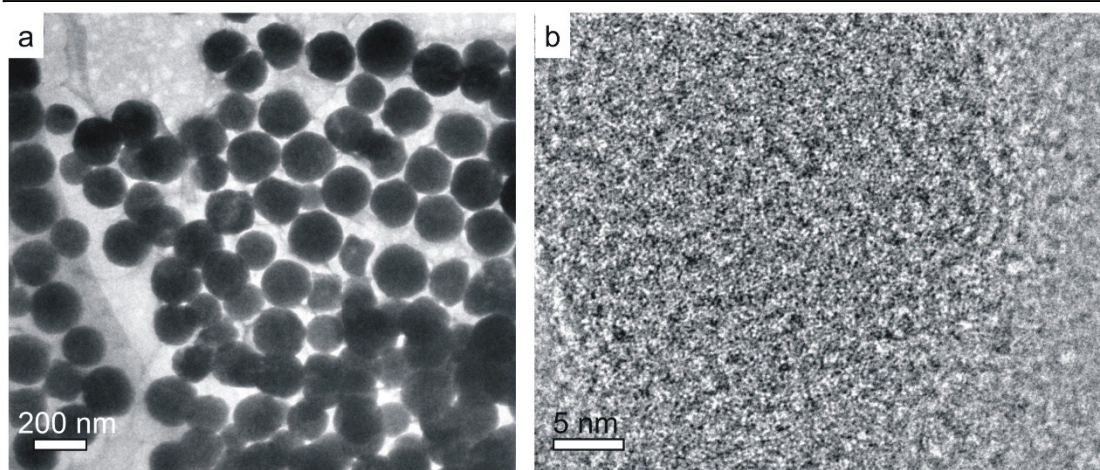
**Fig. S3** Fluorescence spectra of CS (10 mg mL<sup>-1</sup>) solution.



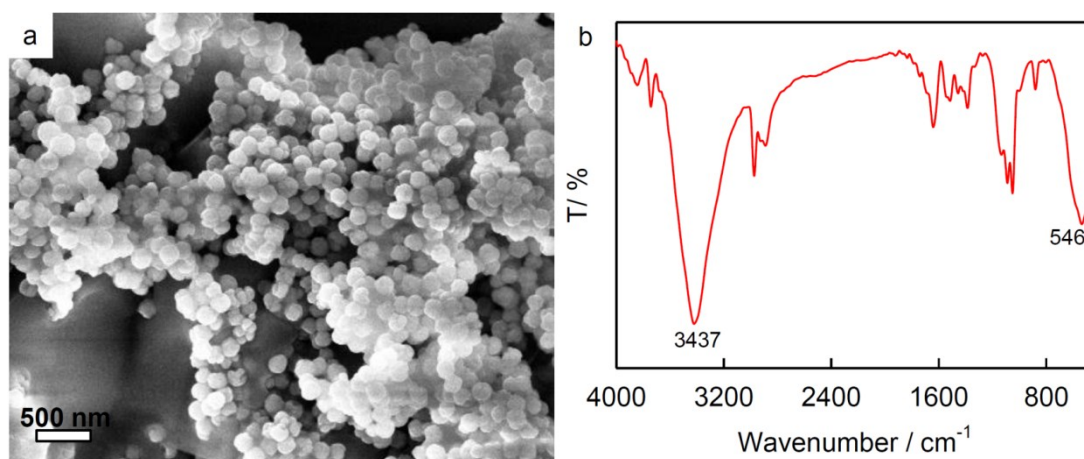
**Fig. S4** Standard curve of fluorescent intensity as functions of the concentration of AuNCs@CS nanocapsules in 0.10 M PBS.



**Fig. S5** Apparent Zeta potentials of AuNCs and CS at pH 3.2 (a) and 3.8 (b).

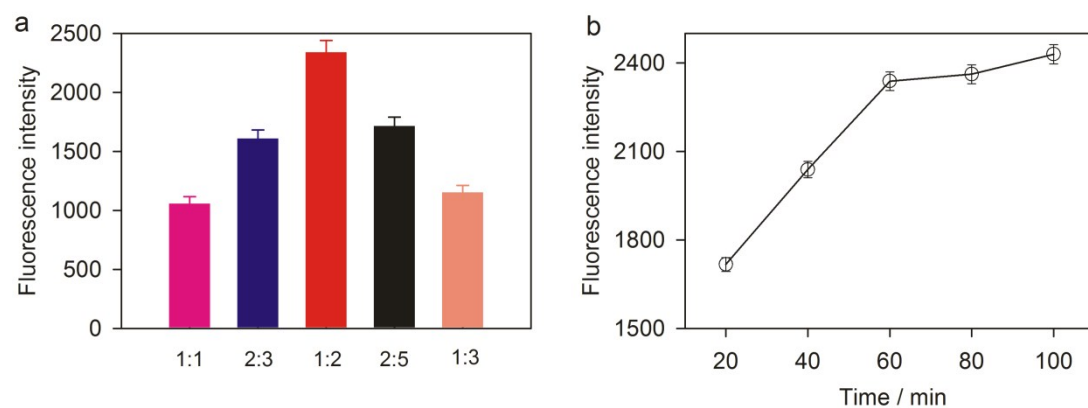


**Fig. S6** TEM (a) and HRTEM (b) images of CS nanocapsules.

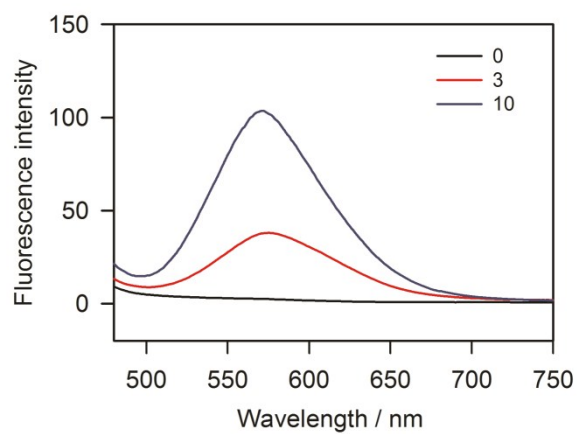


**Fig. S7** SEM image (a) and FT-IR spectrum (b) of amino-functionalized Fe<sub>3</sub>O<sub>4</sub> nanoparticles.

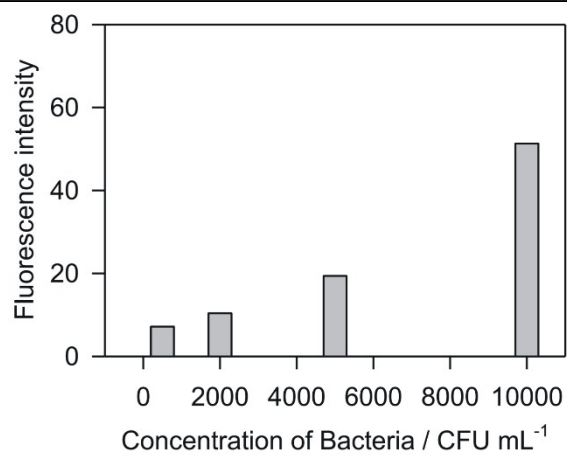




**Fig. S8** (a) Effect of the weight ratio of immunofluorescent nanocapsules and immunomagnetic nanoparticles on the fluorescent intensity at 572 nm for the detection of 700 CFU mL<sup>-1</sup> *E. coli* O157:H7. (b) Effect of incubation time on the fluorescent intensity at 572 nm for the detection of 700 CFU mL<sup>-1</sup> *E. coli* O157:H7.



**Fig. S9** Fluorescence spectra for the determination of 0, 3, and 10 CFU mL<sup>-1</sup> *E. coli* O157:H7 using immunofluorescent nanocapsules as fluorescent labels.



**Fig. S10** The fluorescent emission of *Escherichia coli* O157:H7 at the excitation wavelength of 422 nm.

**Table S1.** The measured capture efficiency.<sup>a</sup>

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<i>E. coli</i> O157:H7 concentration (CFU mL <sup>-1</sup> )	Capture efficiency
3	100%
10	100%
100	>98%
500	>98%
1000	>96%
5000	>95%
10000	>95%
20000	>90%

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<sup>a</sup> After immunomagnetic capture and separation, by quantitatively detecting the rest of *E. coli* O157:H7 cells in PBS using the traditional plate-counting method, the capture efficiency was obtained.

**Table S2. The comparison of the determination of *E. coli* on the literature**

Method	Linear range (CFU mL <sup>-1</sup> )	LOD (CFU mL <sup>-1</sup> )	Ref.
Fluorescence	$1.0 \times 10^3 - 5.0 \times 10^7$	330	1
Fluorescence	$1.0 \times 10^3 - 1.0 \times 10^8$	100	2
Fluorescence	$3.81 \times 10^2 - 2.44 \times 10^4$	460	3
Impedimetric immunosensor	$30 - 3.0 \times 10^4$	300	4
Fluorescence	$10^2 - 10^5$	$10^2$	5
UV-Vis spectroscopy	$4 \times 10^2 - 4 \times 10^7$	$5 \times 10^3$	6
Impedimetric immunosensor	$1.5 \times 10^2 - 1.5 \times 10^7$	$1.5 \times 10^2$	7
Cyclic voltammetry	$30 - 3 \times 10^7$	~30	8
Electrochemical-chemical-chemical redox cyclic voltammetry	$10^3 - 10^8$	$10^3$	9
Surface plasmon resonance imaging	-	$10^2$	10
Surface plasmon resonance	$3 \times 10^3 - 3 \times 10^8$	$3 \times 10^3$	11
Colorimetry	$10^4 - 10^7$	10	12
Chemiluminescence immunoassay	$4.3 \times 10^3 - 4.3 \times 10^5$	$1.2 \times 10^3$	13
Fluorescence	$3 - 10^3$	1	Our work

**Table S3.** Results of determination of *E. coli* O157:H7 in real samples.

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Sample	Added (CFU mL <sup>-1</sup> )	Detected (CFU mL <sup>-1</sup> )	RSD (%)	Recovery (%)
Milk	3×10 <sup>2</sup>	2.90×10 <sup>2</sup>	1.37	96.7
	5×10 <sup>2</sup>	4.85×10 <sup>2</sup>	1.24	97.0
	7×10 <sup>2</sup>	7.10×10 <sup>2</sup>	0.97	100.1
Water	3×10 <sup>2</sup>	3.10×10 <sup>2</sup>	0.81	103.3
	5×10 <sup>2</sup>	4.80×10 <sup>2</sup>	0.87	96.0
	7×10 <sup>2</sup>	7.20×10 <sup>2</sup>	0.45	102.8

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