Electronic Supplementary Material (ESI) for Analytical Methods.

Supporting Information

Quantitative detection of severe fever with thrombocytopenia syndrome virus via electrochemiluminescence immunoassay

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Reagents and chemicals

Cadmium Chloride ($CdCl_2 \cdot 2.5\ H_2O$) was bought from Shanghai Jinshan Tingxin Chemical Reagent Co. Ltd. $NaBH_4$, tellurium powder (Te), ethylene glycol (EG), $FeCl_3 \cdot 6\ H_2O$, trisodium citrate dehydrate ($Na_3Cit \cdot 2\ H_2O$) and sodium acetate anhydrous (NaAc) were obtained from Sinopharm Chemical Reagents Co. Ltd. Glutaraldehyde (GA), $_L$-cysteine, (3-aminopropyl) triethoxysilane (APTES) and tetraethyl orthosilicate (TEOS) were provided by Aladdin Industrial Corporation. EDC was supplied by Sigma-Aldrich. BSA was obtained from Sangon Biotech Co., Ltd. $ZnCl_2$ was provided by West Long Chemical Co. Ltd. FITC-labeled Ab_1 was purchased from Linc-Bio Science Co., Ltd. Distilled water was used throughout the experiment.

Apparatus and measurements

TEM was carried out on JEM-2100 electron microscope (JEOL Ltd). FL was performed on FluoroMax-4 fluorescence spectrophotometer (Horiba, USA). UV-Vis absorption spectra were obtained from Shimadzu UV-2450 Spectrophotometer (Tokyo, Japan). The FTIR spectrum was recorded on Nicolet 5700 (USA) IR spectrometer. The confocal fluorescence image was photographed on Laser Scanning Confocal Microscope (LSM700). Electrochemical impedance spectroscopy (EIS) was measured on the Gamry Reference 600 electrochemical workstation.

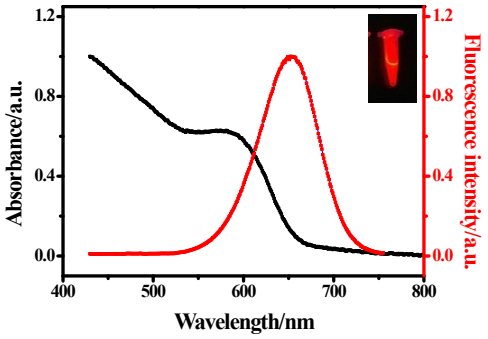

Figure S1 Ultraviolet-visible absorption spectrum and fluorescence emission spectrum of CdZnTeS QDs.

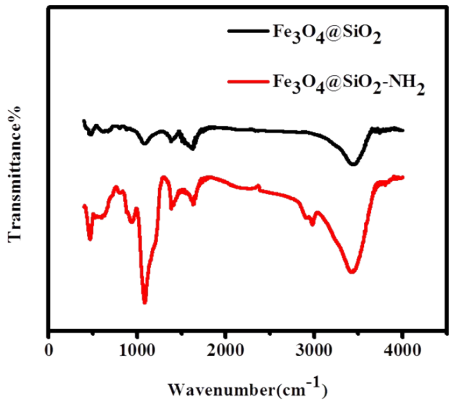

Figure S2 FTIR spectra of the synthetic Fe_3O_4@SiO_2 and Fe_3O_4@SiO_2-NH_2.

Two new bands at 2923 and 2858 cm^{-1} appeared after treated by APTES, which were attributed to the C-H stretching vibration of propyl group. Moreover, the broad band located at 3441 cm^{-1} was ascribed to N-H stretching vibration. FTIR spectra indicated that the surface of Fe_3O_4@SiO_2 was aminated successfully.

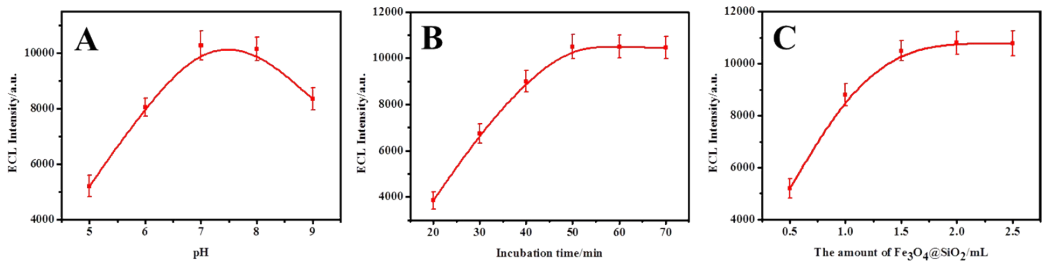

Figure S3 The optimization of (A) pH, (B) incubation time and (C) the amount of Fe_3O_4@SiO_2.

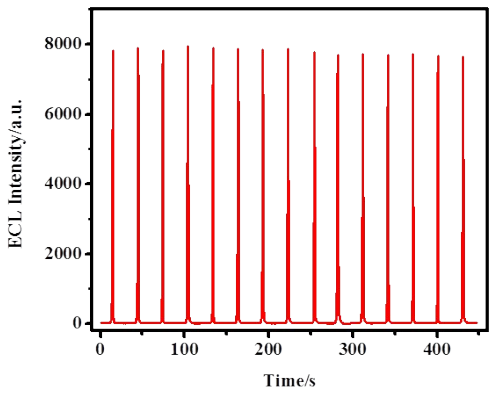

Figure S4 The continuous cyclic potential scanning of 100 fg/mL SFTSV immunosensor.

Table S1 Comparison of test results between this work and other methods.

Number	Materials, Methods	Detection limit	Reference
1	Minor-groove-binding probe, RT-PCR method	10 copies/μL	1
2	TaqMan probes, RT-PCR method	10 copies/μL	2
3	Colloidal gold, Paper-based lateral flow immunochromatography test strips	1 ng/mL	3
4	CdZnTeS QDs, Electrochemiluminescence	0.003 fg/mL	This work

Table S2 Recovery tests of SFTSV spiked in the human serum by the fabricated immunosensor.

SFTSV concentration in the serum (pg/mL)	Added SFTSV concentration (pg/mL)	Measured concentration (pg/mL)	Average value (pg/mL)	RSD (%)	Recovery (%)
50	40	93.3, 88.7, 93.5, 94.8, 91.2	92.3	2.59	102.56
	50	96.6, 104.7, 103.4, 106.3, 99.2	102.04	3.94	102.04
	60	106.5, 107.3, 111.8, 114.6, 113.5	110.74	3.30	100.67
500	400	918.2, 907.7, 893.5, 883.9, 894.3	899.52	1.50	99.95
	500	988.1, 982.6, 996.4, 1009.3, 991.1	993.5	1.02	99.35
	600	1076.6, 1053.2, 1107.9, 1103.8, 1118.1	1091.92	2.43	99.27

Reference

1. Z. Li, L. Cui, M. Zhou, X. Qi, C. Bao, J. Hu, J. Shan, B. Wu, S. Wang, X. Guo, Y. Jiao, F. Tang and H. Wang, *J. Med. Virol.*, 2013, **85**, 370-377.

2. Z. Li, X. Qi, M. Zhou, C. Bao, J. Hu, B. Wu, S. Wang, Z. Tan, J. Fu, J. Shan, Y. Zhu and F. Tang, *Arch. Virol.*, 2013, **158**, 1857-1863.

3. J.-Y. Zuo, Y.-J. Jiao, J. Zhu and S.-N. Ding, *ACS Omega*, 2018, **3**, 15399-15406.