

Supplementary materials

Sensitive electrochemical immunoassay of Metallothionein-3 based on $K_3[Fe(CN)_6]$ as redox active signal and C-dots/nafion film for antibody immobilization

Min Chen^{a,b,1}, Chengfei Zhao^{c,1}, Wei Chen^c, Shaohuang Weng^{c*}, Ailin Liu^c, Qicai Liu^d, Zongfu Zheng^e, Jianhua Lin^{a*}, Xinhua Lin^{c,e*}

a: Department of Orthopaedics, the First Affiliated Hospital of Fujian Medical University, Fuzhou 350004, P. R. China

b: Department of Orthopedic Surgery, Affiliated Union Hospital of Fujian Medical University, Fuzhou 350004, P. R. China

c: Department of Pharmaceutical Analysis, Faculty of Pharmacy, Fujian Medical University, Fuzhou 350004, China

d: Department of Clinical Laboratory, The First Affiliated Hospital of Fujian Medical University, Fuzhou 350004, China

e: The 476 Hospital of PLA, Fuzhou, 350002, P. R. China

*Corresponding authors: Weng, S., E-mail: wengshaohuang@gmail.com, Lin, X., E-mail: xhl1963@sina.com, Tel./fax: +86 591 22862016; Lin, J., E-mail: linjianhua2009@gmail.com; Tel./fax: +86 591 83357199;

1: Min Chen and Chengfei Zhao contributed equally to this work.



Fig. S1 Image of K-CS solution

The result showed the FITC labeled Ab immobilized on C-dots/nafion and K-CS-GA modified glass, which released visible green fluorescence under the fluorescent invert microscopy. Some concentrated spot showed much brighter fluorescence, which indicated the antibody aggregation on the C-dots/nafion and K-CS-GA modified surface. (*Fluorescent image was obtained using Nikont TE 2000 Fluorescent invert microscopy*)

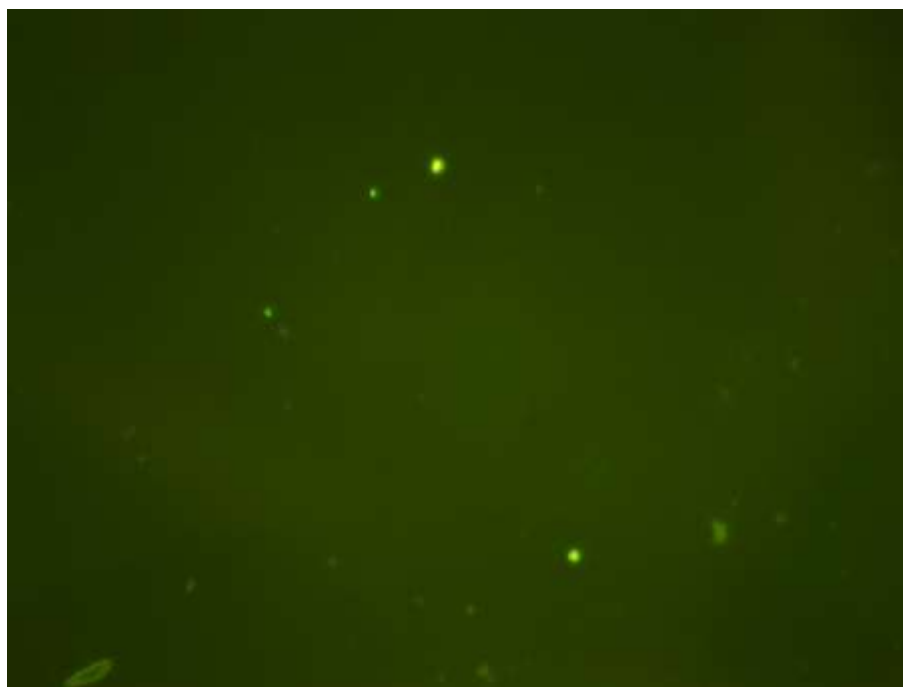


Fig. S2 Fluorescence image of FITC labeled Ab immobilized on the C-dots/nafion -covered K-CS-GA modified glass .

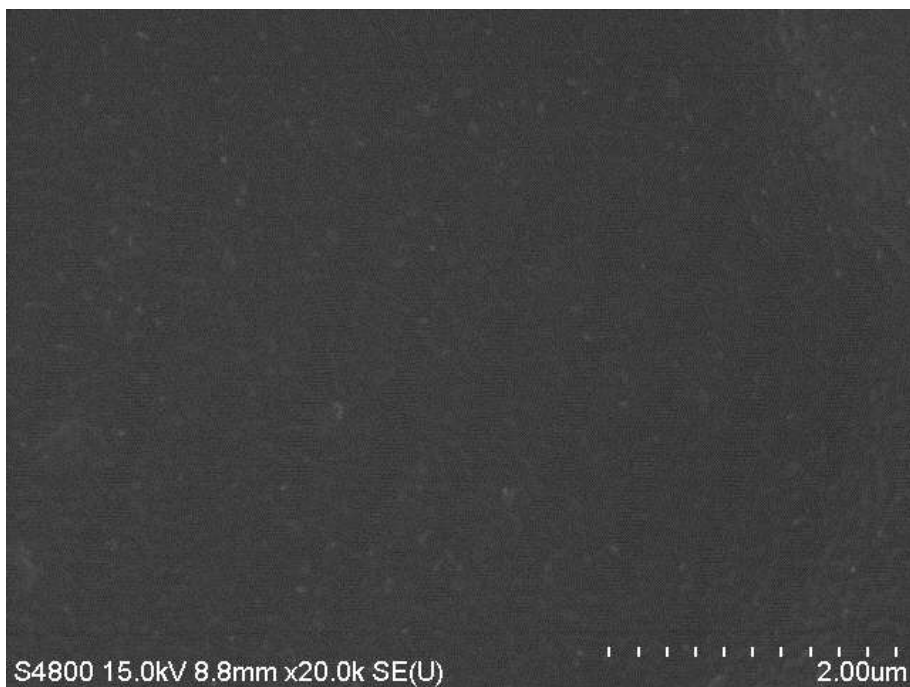


Fig. S3 SEM image of K-CS-GA and C-dots/nafion modified GCE.

The spectrum of the K-CS solution exhibited the similar absorption bands to those of the $K_3[Fe(CN)_6]$ solution at 300 and 423 nm, which were attributed to $K_3[Fe(CN)_6]$ absorption properties.

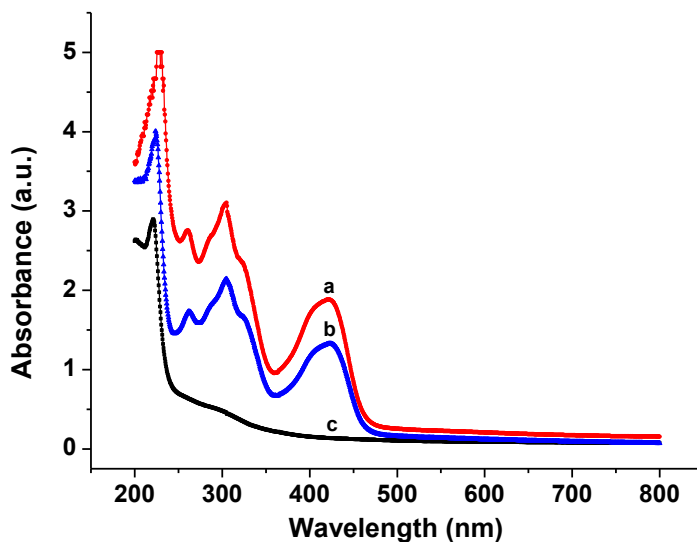


Fig. S4 UV/Vis spectra of (a) $K_3[Fe(CN)_6]$ solution, (b) K-CS solution (diluted three times with water), and (c) CS solution.

Table S1

Comparison of analytical performances of several label-free electrochemical immunosensors

| Sensors | Linear range (ng/ml) | LOD (pg/ml) | Reference |
|--|------------------------------------|---------------------|-----------|
| Anti-AFP/graphene and thionine nanocomposite | 0.05 –2.00 | 5.77 | 1 |
| Anti-TNF/Fc-redox polymer segment(PFMMA-P(GMA-Ab)) | 0.01-1000 | 3.94 | 2 |
| Anti-TNF/Fc-redox polymer segment(P(GMA-Ab)-PFMMA) | 0.01-1000 | 4.64 | 2 |
| Anti-IgG/Au nanoparticles/GCE | 10-10000 | 3000 | 3 |
| anti-CEA/PEI/AuNP@nafion/FC@CHIT/GCE | 0.01-150 | 3 | 4 |
| Anti-CEA/Ag–SiO ₂ @nafion/THI@CHIT/GCE | 10 ⁻⁶ - 0.1 | 0.001 | 5 |
| nanoporous Al ₂ O ₃ membranes / SPCE | 10 ⁵ -5*10 ⁵ | 9.8*10 ⁷ | 6 |
| Antigen-RBP/Ag@BSA microspheres | 50-4500 | 18000 | 7 |
| Anti-PSA/ Nanoporous gold film | 0.05 -26 | 3 | 8 |
| Anti-ovalbumin monoclonal antibody/Graphene-modified SPCE | 0.001-500 | 0.83 | 9 |
| Anti-MT-3/C-dots/nafion/ K-CS-GA | 0.005-20 | 2.5 | This work |

Reference

- 1 Q. Wei, K Mao, D. Wu, Y. Dai, J. Yang. B. Du, M. Yang and H. Li, *Sensors and Actuators B*, 2010, 149, 314.
- 2 L. Yuan, W. Wei and S. Liu, *Biosens. Bioelectron.*, 2012, 38, 79.
- 3 L. Qiu, C. Wang, P. Hu, Z. Wu, G. Shen and R. Yu, *Talanta*, 2010, 83, 42.
- 4 W. Shi and Z. Ma, *Biosens. Bioelectron.*, 2011, 26, 3068.
- 5 R. Wang, X. Chen, J. Ma and Z. Ma, *Sensors and Actuators B*, 2013, 176, 1044.
- 6 A. Escosura-Muñiz and A. Merkoçi, *Electrochemistry Communications*, 2010, 12, 859.
- 7 C. Hu, D. Yang, K. Xu, H. Cao, B. Wu, D. Cui and N. Jia, *Anal. Chem.*, 2012, 84, 10324.
- 8 Q. Wei, Y. Zhao, C. Xu, D. Wu, Y. Cai, J. He, H. Li, B. Du and M. Yang, *Biosens. Bioelectron.*, 2011, 26, 3714.
- 9 S. Eissa, L. L'Hocine, M. Siaj and M. Zourob, *Analyst*, 2013, 138, 4378.