Electronic Supplementary Material (ESI) for Journal of Materials Chemistry B.

Supporting Information

A 3D electrochemical immunodevice based on a porous Pt-paper electrode and metal ions functionalized flower-like Au nanoparticles

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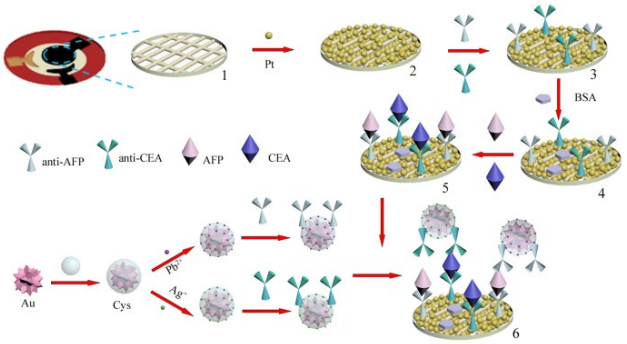

Scheme S1 The schematic representation of the fabrication procedure for this 3D origami EC immunodevice. (1) bare PWE; (2) NPPt-PWE; (3) after immobilization with Ab_1; (4) after blocking with BSA; (5) after capture and washing; (6) after incubation with signal antibodies and washing.

Characterization of Pt NPs seeded cellulose fibers

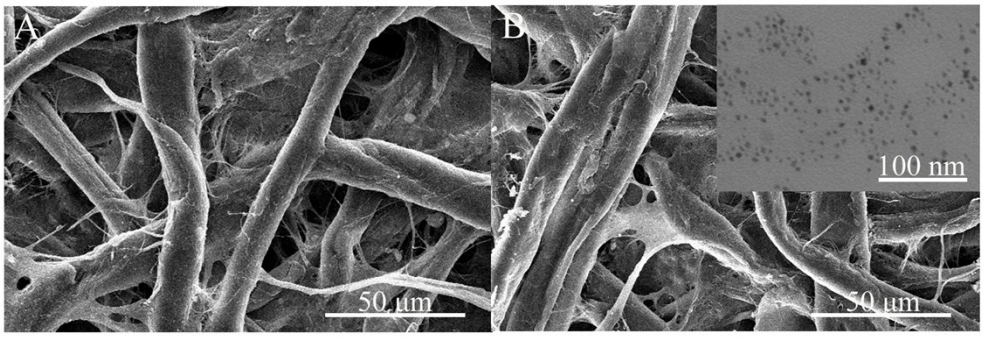

Fig. S1. SEM images of (A) bare PWE; (B) Pt NPs seeded paper. Inset: TEM image of Pt NPs seeds.

Characterization of flower-like Au-Cys/metal ion bioconjugates

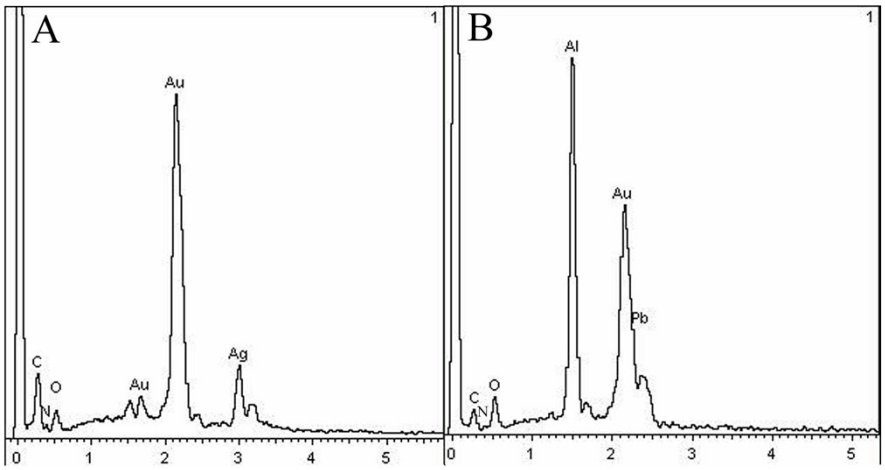

Fig. S2. (A) EDS of flower-like Au-Cys/Ag^{+} label; (B) EDS of flower-like Au-Cys/Pb^{2+} label.

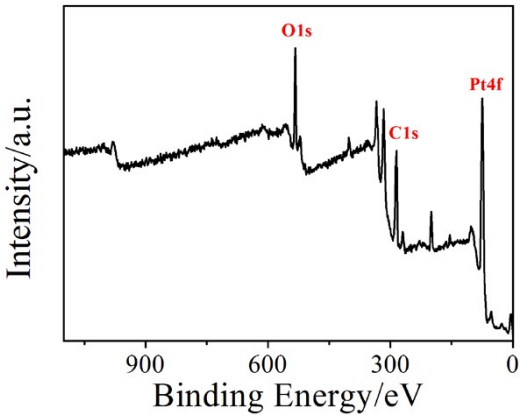

Fig. S3. XPS analysis of NPPt-PWE.

EC characterization of the μ-PEID

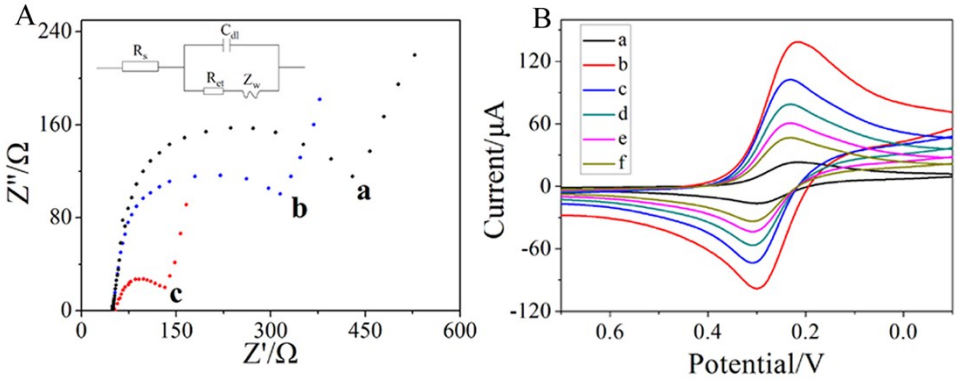

Fig. S4. (A) EIS of the PWE: (a) bare PWE; (b) Pt NPs seeded PWE; (c) NPPt-PWE; (B) CV of : (a) bare PWE; (b) NPPt-PWE; (c) Ab_1/NPPt-PWE; (d) BSA/Ab_1/NPPt-PWE; (e) antigen/BSA/Ab_1/NPPt-PWE; (f) flower-like Au-Cys/metal ion/Ab_2 label /antigen/BSA/Ab_1/NPPt-PWE.

Optimization of detection conditions

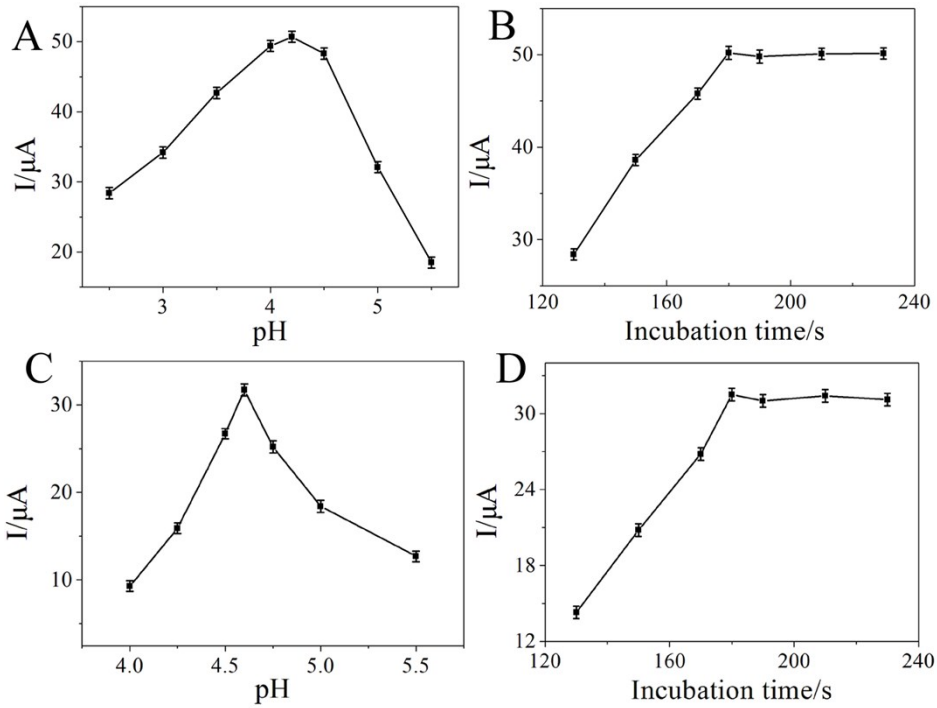

Fig. S5. Effect of (A,C) pH of detection solution and incubation time (B,D) for 1 ng·mL^{-1} AFP and CEA, where n = 5 for each point.

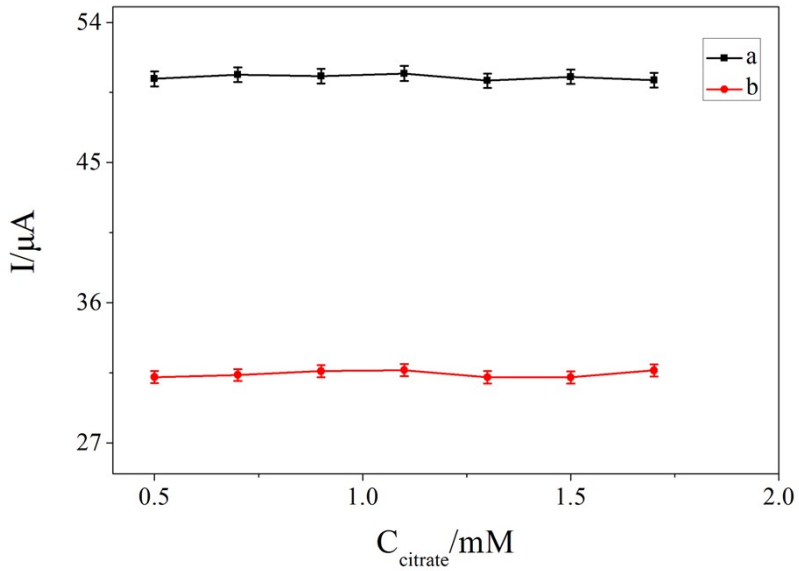

Fig. S6. Effect of the concentration of citrate used in Au NPs seeds fabrication for 1 ng·mL^{-1} AFP and CEA.

Evaluation of repeatability, specificity, stability and cross-reactivity

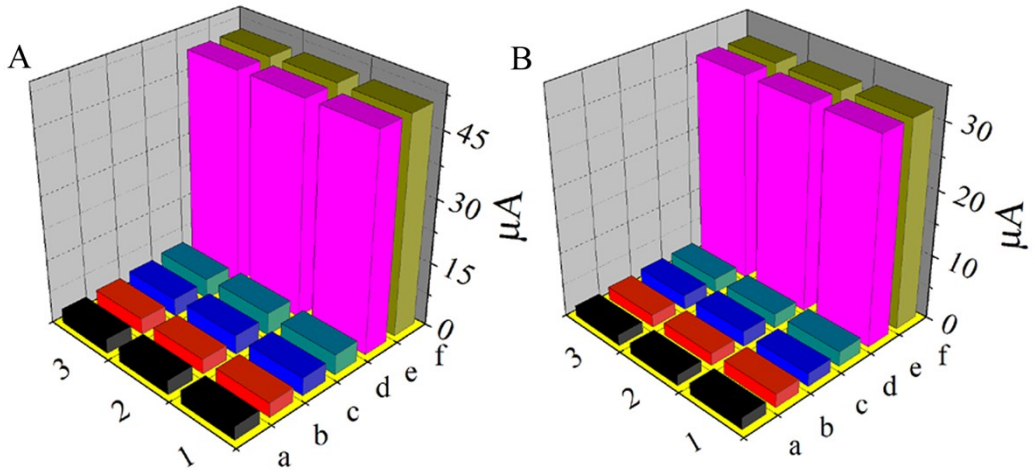

Fig. S7. The selectivity of the proposed EC immunosensor in the presence of (a) BSA (10 mg·mL^{-1}), (b) glucose (10 mg·mL^{-1}), (c) hemoglobulin (10 mg·mL^{-1}), (d) human IgG (10 mg·mL^{-1}), (e) BSA (10 mg·mL^{-1}) + glucose (10 mg·mL^{-1}) + hemoglobulin (10 mg·mL^{-1}) + human IgG (10 mg·mL^{-1}) + corresponding antigens (1 ng·mL^{-1}), (f) corresponding antigens (1 ng·mL^{-1}). The corresponding antigens were AFP (A) and CEA (B), respectively.

Table S1 The results of comparing with other immunoassay biosensing systems toward CEA.

Detection methods	Linear range (ng·mL^{-1})	Detection limit (ng·mL^{-1})	References
EC	0.5-120	0.4	1
Electrochemiluminescence	1.0-100	0.5	2
EC	0.01-160	0.005	3
EC	0.004-200	0.0013	Proposed method

Table S2 The results of comparing with other immunoassay biosensing systems toward AFP.

Detection methods	Linear range (ng·mL^{-1})	Detection limit (ng·mL^{-1})	References
EC	0.05-200	0.05	4
EC	0.01-50	0.0031	5
Fluorescence	2.4-960	0.4	6
EC	0.004-200	0.001	Proposed method

References

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