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

Electronic Supplementary Information

Photoelectrochemical Detection of Tumor Marker Based on CdS Quantum Dots/ZnO Nanorods/Au@Pt-Paper Electrode 3D Origami Immunodevice

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1. Design and Fabrication of 3D origami PEC device

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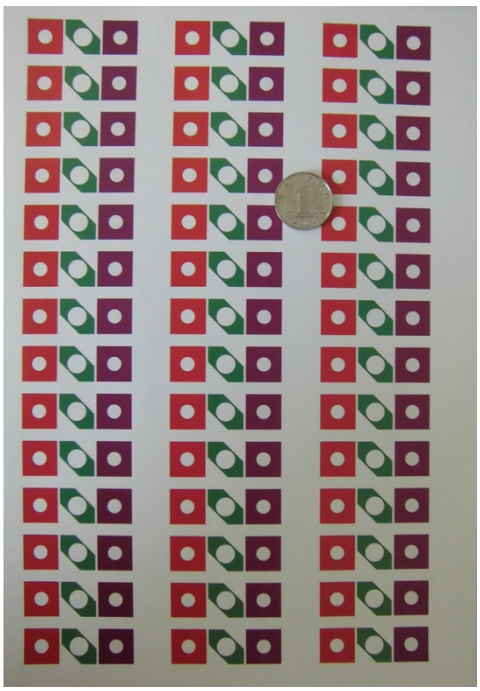

Fig. S1A Wax-printed 3D PEC origami device on a paper sheet (A4) before baking.

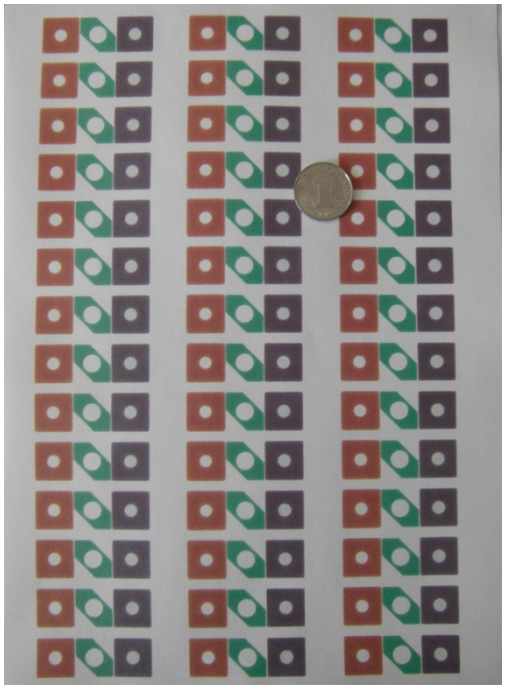

Fig. S1B Wax-printed 3D PEC origami device on a paper sheet (A4) after baking.

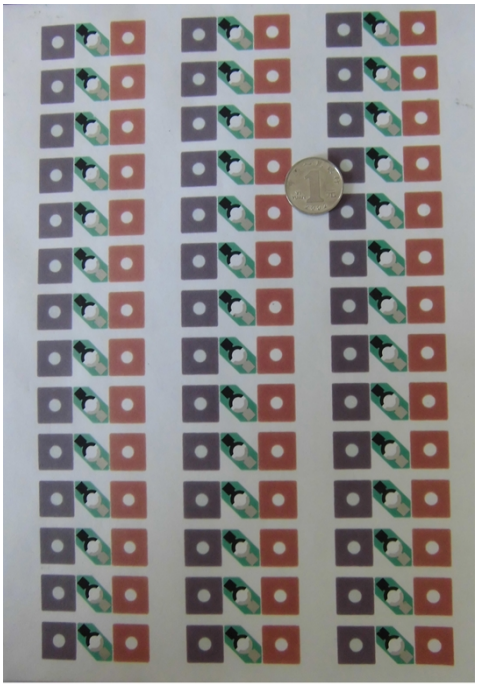

Fig. S1C 3D PEC origami device on a paper sheet (A4) after screen-printing of Ag/AgCl auxiliary electrode and carbon counter electrode on one surface of paper.

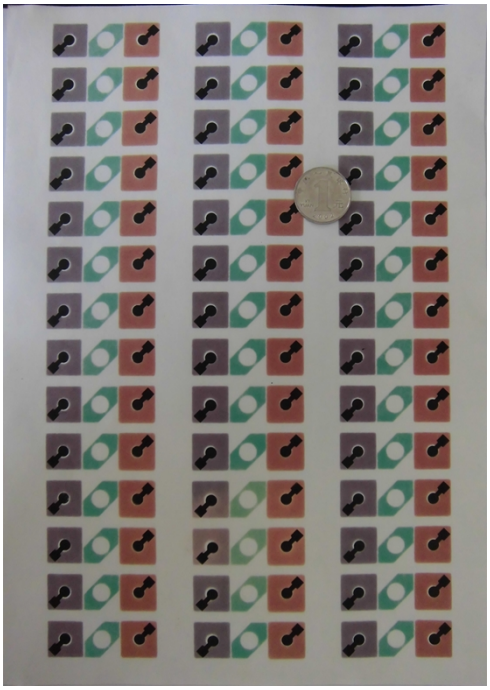

Fig. S1D 3D PEC origami device on a paper sheet (A4) after screen-printing of carbon working electrodes on one surface of paper.

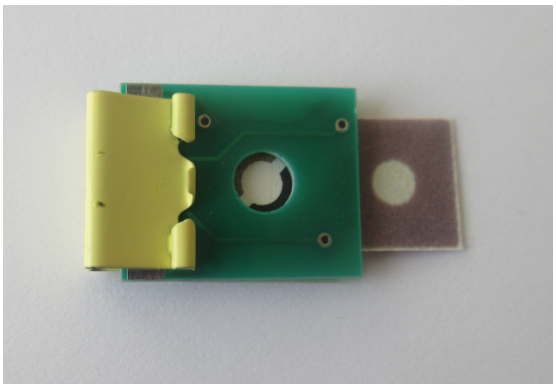

Figure S1E A photograph of the final device

2. Optimization of experimental conditions

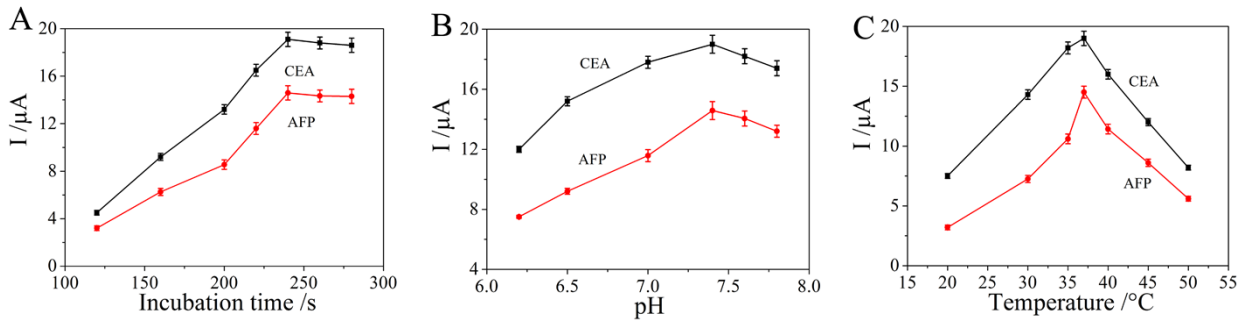

Fig. S2 Effect of incubation time (A), pH (B) and temperature (C) for 0.1 ng·mL^{-1} CEA and AFP on PEC responses of μ-OPECI, respectively, where n = 8 for each point.

3. Analytical performance

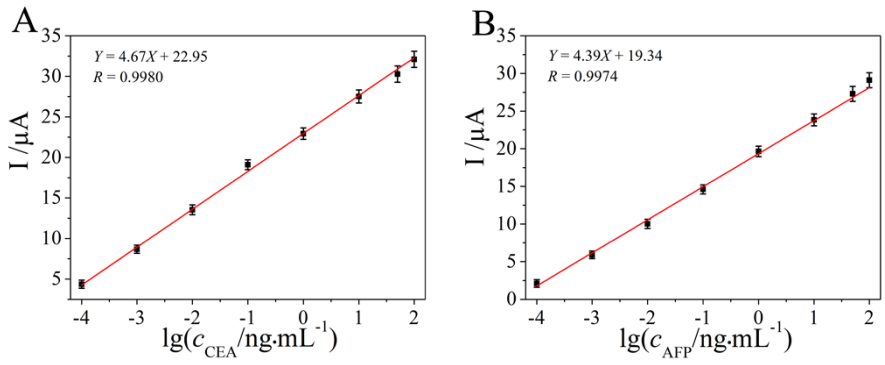

Fig. S3 Logarithmic calibration curves for (A) CEA and (B) AFP (ten measurements for each point).

4. Analytical performance

Table S1 Comparison of analytical properties of different immunoassys toward CEA and AFP

Analytes	Immunoassay method	Linear range ($ng \cdot mL^{-1}$)	Detection limit ($pg \cdot mL^{-1}$)	Reference
CEA	Chemiluminescence	1.0-70	650	1
	Electrochemiluminescence	1.0-100	500	2
	Photoelectrochemical	0.05-20	10	3
	Photoelectrochemical	0.001-100	0.1	4
	Photoelectrochemical	0.001-100	0.3	This work
AFP	Electrochemiluminescence	0.5-100	150	2
	Electrochemical	0.01-200	1.0	5
	Photoelectrochemical	0.05-50	40	6
	Photoelectrochemical	0.001-100	0.5	This work

5. Application in analysis of serum samples

Table S2 Assay results of human serum samples by the proposed and reference method

Samples	CEA concentration ($ng \cdot mL^{-1}$)			AFP concentration ($ng \cdot mL^{-1}$)		
	Proposed method	Reference method	Relative error (%)	Proposed method	Reference method	Relative error (%)
Sample-1	13.4	13.1	2.3	20.5	19.8	3.5
Sample-2	24.1	24.7	-2.4	32.5	31.9	1.9
Sample-3	36.2	35.8	1.1	46.8	47.3	-1.0
Sample-4	54.7	53.9	1.5	64.1	62.8	2.1

References

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