Supplementary data

Label-free immunosensor for detection of a new lung cancer biomarker, GM2 activator protein, using a phosphomolybdic acid/polyethyleneimine coated gold nanoparticles composite

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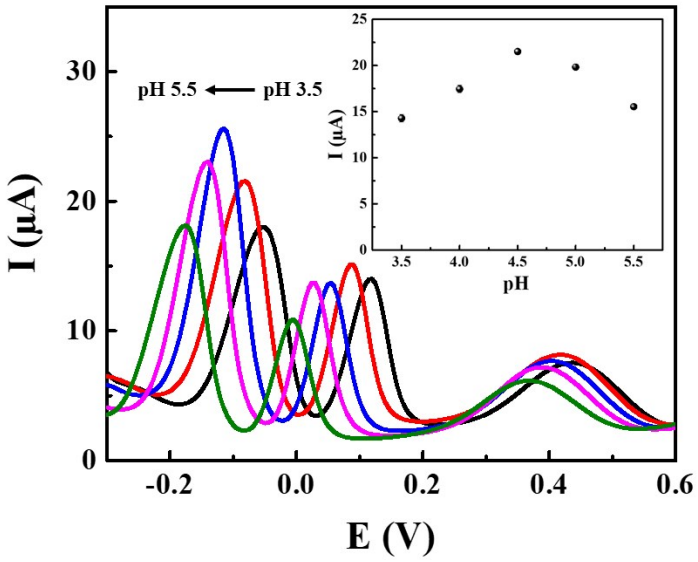

Fig. S1 DPVs of anti-GM2AP/PMA/PEI-AuNPs-modified SPCEs in response to 50 ng/mL GM2AP obtained at 0.20 M acetate buffer with different pH values (3.5, 4.0, 4.5, 5.0 and 5.5). Inset: The influence of pH on the peak current

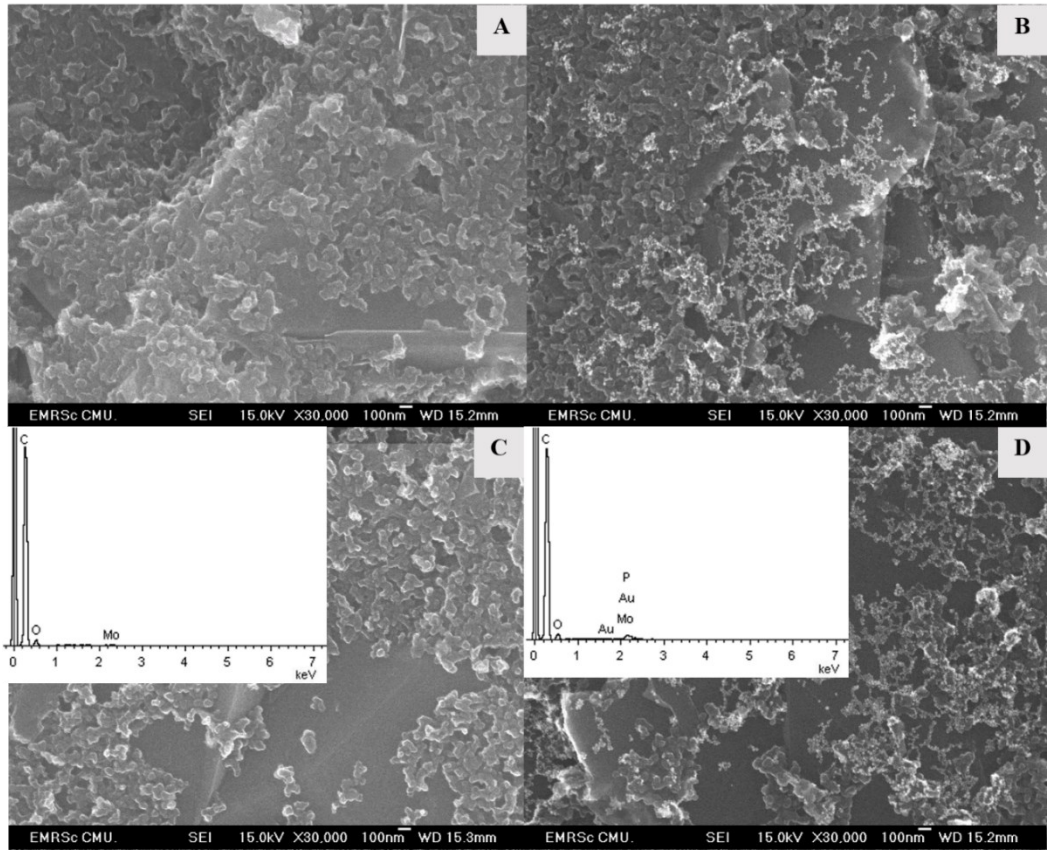

Fig. S2 SEM images of A) bare SPCE and B) PEI-AuNPs-, C) PMA-, and D) PMA/PEI-AuNPs-modified SPCEs. Insets of C) and D) for the corresponding EDS spectra

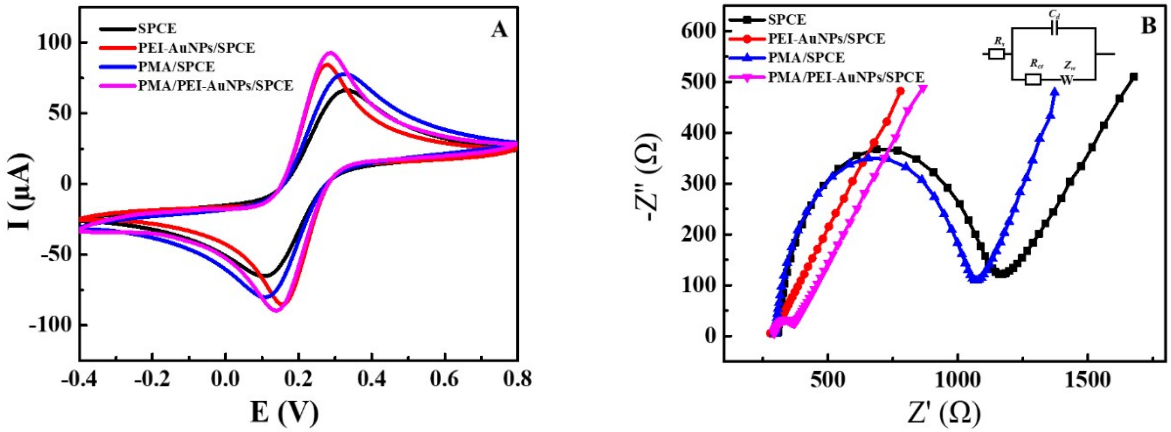

Fig. S3 A) CV curves and B) EIS spectra of bare SPCE and the modified electrodes in 0.10 M PBS (pH 7.4) solution containing 5.0 mM $[Fe(CN)_6]^{3-/4-}$ at a scan rate of 50 mV/s (the inset shows the equivalent circuit model)

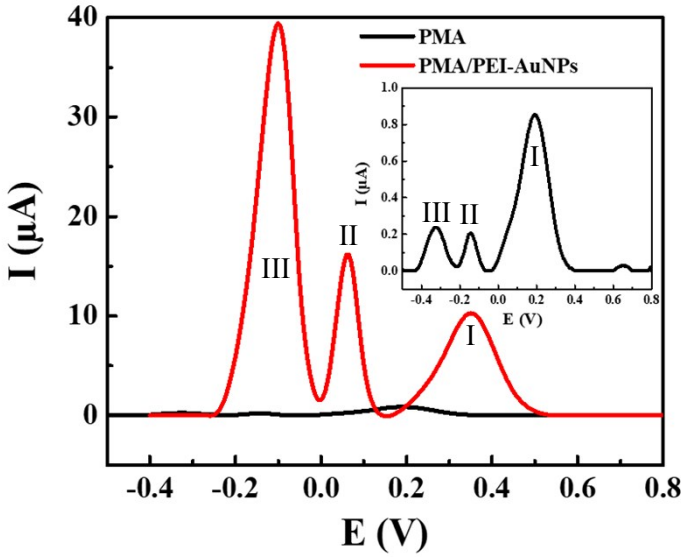

Fig. S4 Comparison of DPV responses of PMA- and PMA/PEI-AuNPs-modified SPCEs in 0.20 M acetate buffer (pH 4.5) at a scan rate of 50 mV/s. The inset is the enlarged image of the PMA responses on SPCE with no PEI-AuNPs

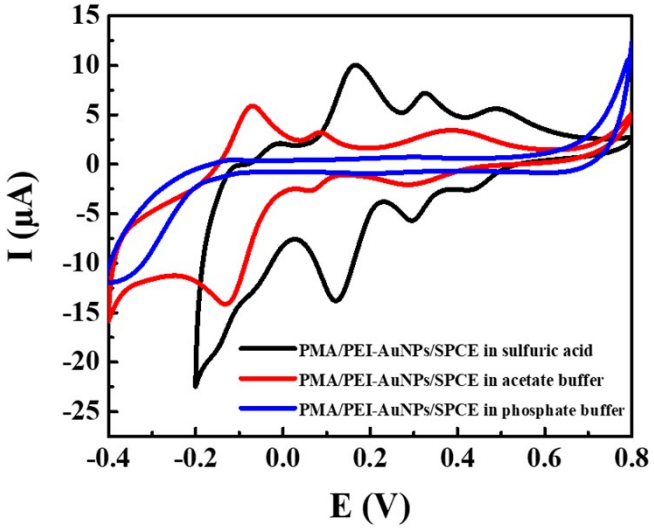

Fig. S5 Comparison of CVs of the PMA/PEI-AuNPs-modified SPCE in 0.10 M sulfuric acid, 0.20 M acetate buffer (pH 4.5) and 0.010 M phosphate buffer saline (pH 7.4) solutions at a scan rate of 50 mV/s

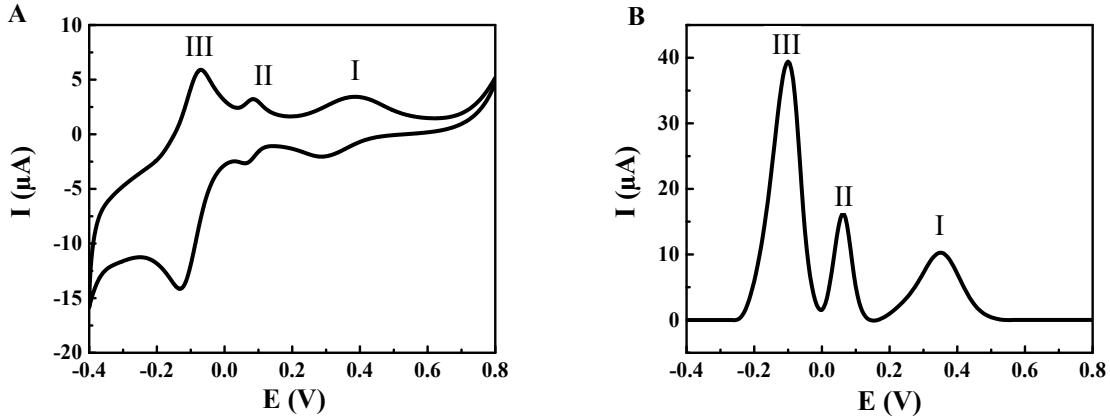

Fig. S6 A) CV and B) DPV current responses of the PMA/PEI-AuNPs-modified SPCE in 0.2 M acetate buffer (pH 4.5) at a scan rate of 50 mV/s

The redox behaviour of PMA

I. $[PMo_{12}O_{40}]^{3-} + 2e^- + 2H^+ \leftrightarrow [H_2PMo_{12}O_{40}]^{3-}$

II. $[H_2PMo_{12}O_{40}]^{3-} + 2e^- + 2H^+ \leftrightarrow [H_4PMo_{12}O_{40}]^{3-}$

III. $[H_4PMo_{12}O_{40}]^{3-} + 2e^- + 2H^+ \leftrightarrow [H_6PMo_{12}O_{40}]^{3-}$

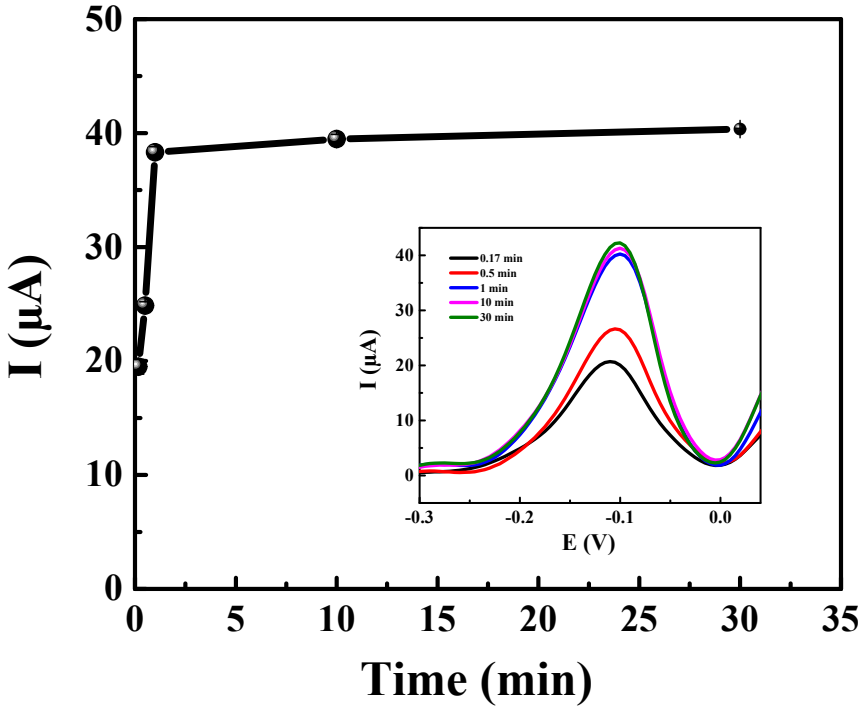

Fig. S7 Study of an adsorption time of PMA on PEI-AuNPs-modified SPCE in 1.0 mM PMA solution via determination of third DPV responses in 0.20 M acetate buffer (pH 4.5) at a scan rate of 50 mV/s

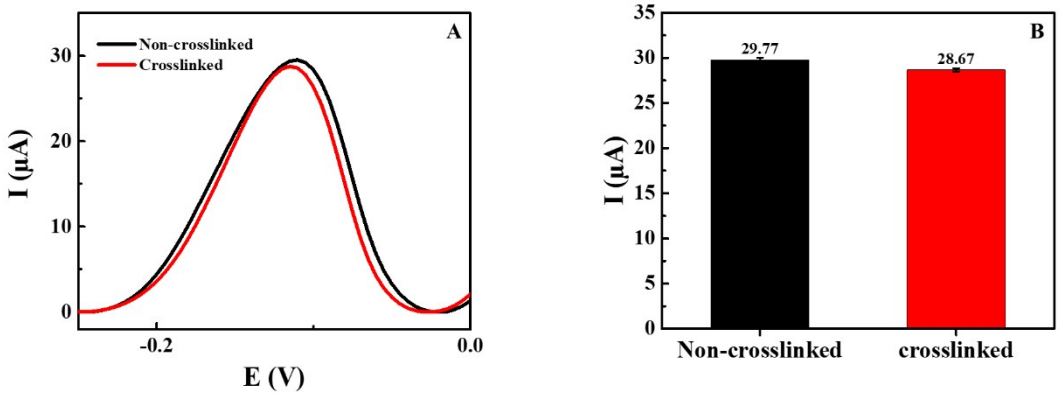

Fig. S8 Comparison of A) DPV current responses and B) bar chart of currents for the electrochemical immunosensors with non-crosslinked and crosslinked with glutaraldehyde

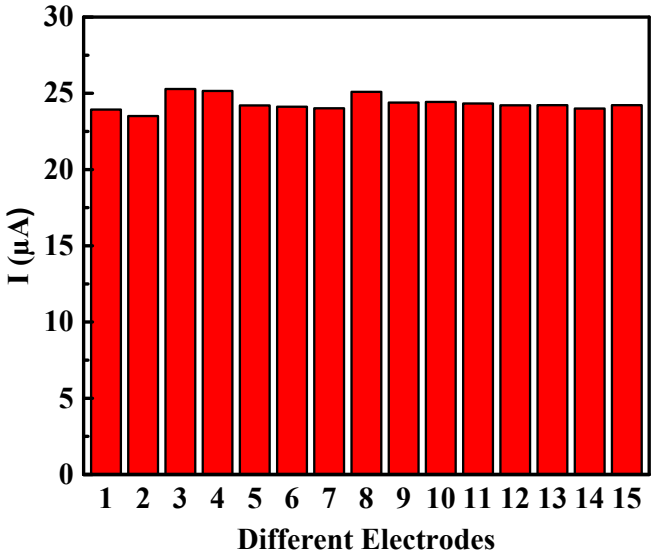

Fig. S9 Reproducibility of the electrochemical immunosensor for GM2AP detection (RSD = 2.0%)

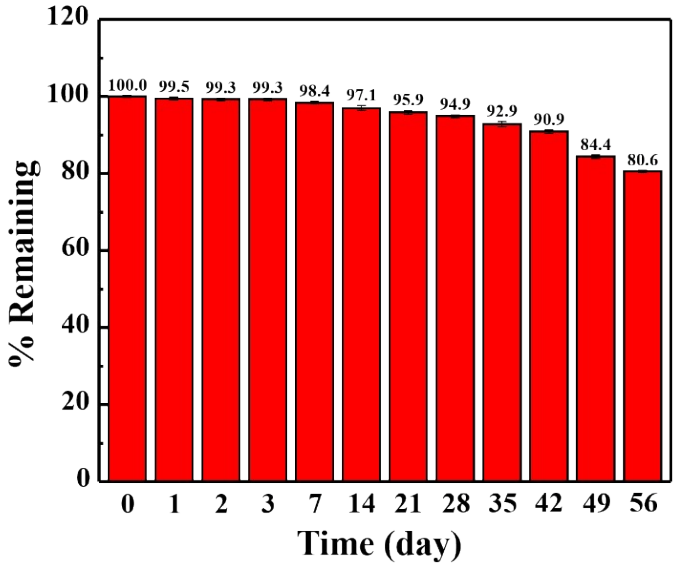

Fig. S10 Stability study of the electrochemical immunosensor for GM2AP detection

Table S1 Comparison of the analytical performances of a few biosensors

Detection method	Electrode	Tumor marker	Linear range	LOD	Ref.
ELISA	-	GM2AP	0.156-10 ng/mL	-	[1]
EC	PMA/targetDNA/captureDNA/GO/Chi/GCE PMA/TB/ATM/GO/Chi/GCE	DNA TB	0.5 pM-10 nM 10 pM-25 nM	0.2 pM 5.8 pM	[2]
EC	anti-GM2AP/PMA/PEI-AuNPs/SPCE	GM2AP	0.005-25, 25-400 ng/mL	3.90 pg/mL	This work

Sandwich enzyme-linked immunosorbent assay (ELISA), Electrochemical immunoassay (EC), Phosphomolybdic acid (PMA), Thrombin (TB), Aptamer (ATM), Graphene oxide (GO), Chitosan (Chi), Glassy carbon electrode (GCE), Gold nanoparticles (AuNPs), Polyethylenimine (PEI), Anti-GM2 activator protein antibodies (anti-GM2AP), Screen-printed carbon electrode (SPCE), GM2 activator protein (GM2AP)

References

1 L. Potprommanee, H. T. Ma, L. Shank, Y. H. Juan, W. Y. Liao, S. T. Chen and C.-J. Yu, J. Thorac. Oncol., 2015, 10, 102-109.

2 T. Wei, Y. Chen, W. Tu, Y. Lan and Z. Dai, Chem. Commun., 2014, 50,9357-9360.