Supplementary Information

Ultrasensitive sandwich-type electrochemical immunosensor based on trimetallic nanocomposite signal amplification strategy for the ultrasensitive detection of CEA

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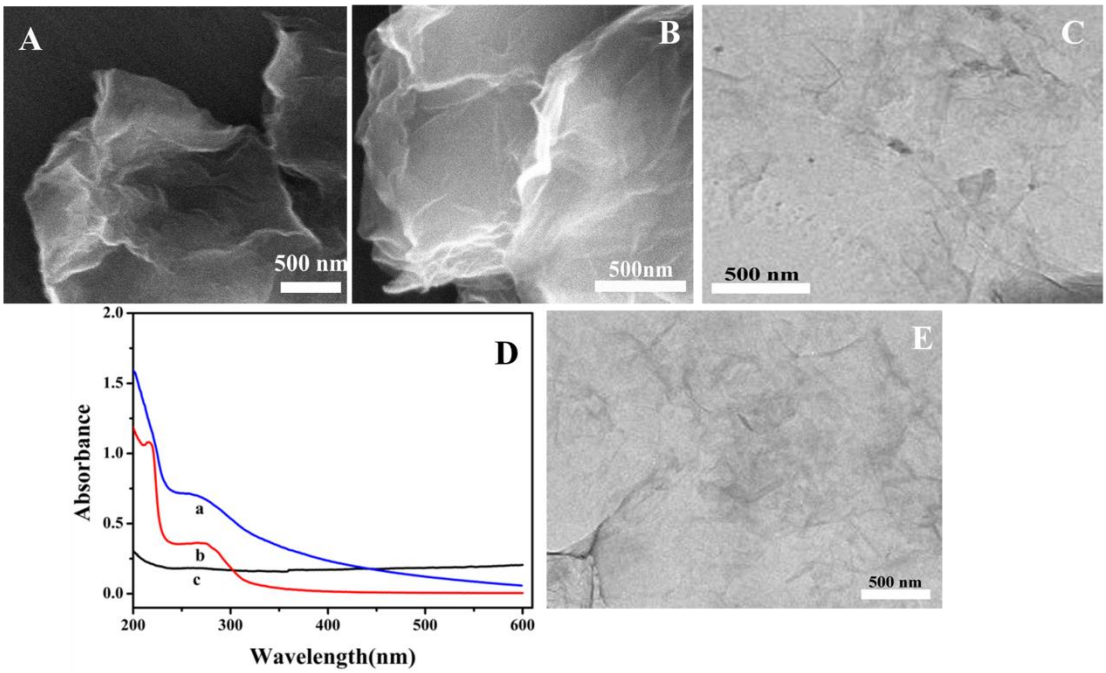

Figure S1 SEM images of NGs (A) and CD-NGs (B); The TEM of NGs (C) and CD-NGs (E); (D) The UV-vis spectra of CD-NGs (a), β-CD (b) and NGs (c);

Table S1 Comparison of the performance of the proposed electrochemical CEA immunosensor for other reports

Nanomaterials	Marker	Linear range (ng/mL)	Limit of Detection (pg/mL)	Reference
PdPt nanocages/MWCNT-Ab_2	CEA	0.001-20	0.2	1
Ab_2-Au-TB-rGO	CEA	0.01-100	3	2
Ag-Ab_2	CEA	0.001-50	0.27	3
Fe_3O_4/Au-Ab_2	CEA	0.001-30	0.39	4
HRP-Ab_2-PtNPs	CEA	0.02-120	12	5
Ab_2-NiAuPt-NGs	CEA	0.001-100	0.27	This work

Table S2. Comparison of different methods for the detection of CEA

Methods	Linear range	Limit of detection	References
FL quenching method	0.257~12.9 ng/mL	5 pg/mL	6
Paper-based microfluidic electrochemical	0.01~100 ng/mL	0.01 ng/mL	7
Electrochemical immunosensor	0.001~20 ng/mL	0.2 pg/mL	1
ECL immunosensor	20 fg/mL~1.0 ng/mL	6.7 fg/mL	8
Electrochemical immunosensor	0.001~100ng/mL	0.27 pg/mL	This method

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